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INTRODUCTORY.

With the March, 1919, issue, THE OTTAWA NATURALIST, the official organ of the Ottawa Field-Naturalists' Club, ceased to exist under that name. THE OTTAWA NATURALIST had a long and honourable career. Like all similar publications it had its trials, its ups and downs, financial troubles, etc., but it weathered all storms and appeared fairly regularly during its thirty-two years of existence. In its pages are to be found many articles of great scientific value and we would like to have space to remind our readers of at least some of the more important of the contributions which it presented. With the increase in its size, improvement of paper, specially prepared articles, etc., Vol. XXXII, certainly may be regarded as an excellent production and one which has brought forth many words of encouragement from its readers.

This, the April issue of the organ of the club appears under a new name—THE CANADIAN FIELD-NATURALIST. Such a change was intimated in the April, 1918, issue of THE OTTAWA NATURALIST, and at the recent annual meeting of the Club, held

on March 18, 1919, the same was duly approved. This change in name will not, of course, affect in any way the spirit of the publication. Such change only reflects its widened sphere of influence. We hope it will develop along improved lines and ultimately be accepted as the organ not only of The Ottawa Field-Naturalists' Club, but of similar organizations throughout Canada. There is an excellent opportunity for the naturalists of Canada to assist in building up this publication and making it truly representative of Canadian scientific research. The popular side will, of course, not be overlooked. Special efforts will be made to make it useful to amateur naturalists, teachers and the public generally.

The subscription price for the present volume which will contain six issues, namely for the months of April, May, September, October, November and December will be \$1.00. Thereafter the volumes will consist of nine issues each volume beginning with the January number; the subscription price of each volume will be increased proportionately.

NOTES ON THE CASPIAN TERN (*STERNA CASPIA*) AND THE PARASITIC JAEGER (*STERCORARIUS PARASITICUS*) IN MANITOBA.

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Island faunæ, ever an interesting field in ornithology, become particularly attractive in continental areas where lake islands afford the only suitable breeding grounds for certain water birds.

The following observations refer to a small but interesting island in the northern part of Lake Winnipeg visited on July the 9th and 13th, 1918, whereon a colony of Caspian Terns (*Sterna caspia*) was found. No record of this species breeding in Manitoba has hitherto been published. A specimen of Parasitic Jaeger (*Stercorarius parasiticus*) was also secured and constitutes the first inland record for this province.

Through the courtesy of the Riverton Fish Company, of Riverton, Man., the authors were enabled to make the journey—a round trip of some 500 miles—from Hnaua to Berens Island. The objects of the trip were first to study if possible, breeding colonies of White Pelicans (*Pelecanus erythrorhynchos*) and second, to gather some idea of the biological conditions on the northern portion of the lake. The original intention to make Reindeer Island the base proved impracticable and a camp was established at Swampy Bay, Berens Island, where the Riverton Fish Company maintained a large fishing station. We desire to express

our warm appreciation of the sympathetic assistance afforded by the men at the stations, particularly by Mr. Johnny Jonasson. Berens Island was chosen mainly because of the possibility that White Pelicans would be found breeding on Pelican Island which lies some four or five miles west of Berens Island.

Pelican Island lies approximately in longitude $95\frac{1}{2}$ and latitude $52\frac{1}{2}$ and is a typical, rocky lake island, some ten to fifteen acres in extent. Between Pelican Island and the northern shore of the lake, there are no islands and so its north coast meets the full force of the waves raised by the winds sweeping across this 100 miles of open water. Lake Winnipeg with its area of over 8,000 square miles, is very dangerous owing to its quick changes from calm to storm and fishermen familiar with the whole lake, declare this region between Pelican and Berens Islands to be the worst. The shores of Pelican Island are extremely rocky—there are no sand beaches—and a landing from a rowboat requires cautious management even in calm weather. The island is partly wooded with birch, ash, etc., but inland the ground is depressed in a basin-like central hollow, overgrown with marsh vegetation. A barren tongue of land juts out from the east side of the island forming a shingle spit.

THE TERNERY.

The first time the authors approached the island in a skiff, flocks of birds were observed resting on the eastern point, while with prism binoculars, Herring Gulls and Terns could be distinguished everywhere along the shingle spit and adjacent shore. Two young Herring Gulls, still in natal down, ran down the beach to the water as the boat reached land. One of these was captured. The uproar among the birds caused by the landing increased when the shingle spit was reached. Numerous deserted Herring Gulls' nests, substantially built of vegetable debris, lined the edge of the grass zone or were scattered over the bare pebbles and everywhere were the remains of pellets disgorged by the gulls. No eggs were found until the zone of vegetation had ended, when, passing out onto the bare eastern spit, a densely populated ternery was discovered. Over this space were between 200 and 300 occupied nests, frequently almost touching, each containing one or two eggs. After a brief survey of the ternery, a low hiding blind was erected and left for the birds to return to the colony.

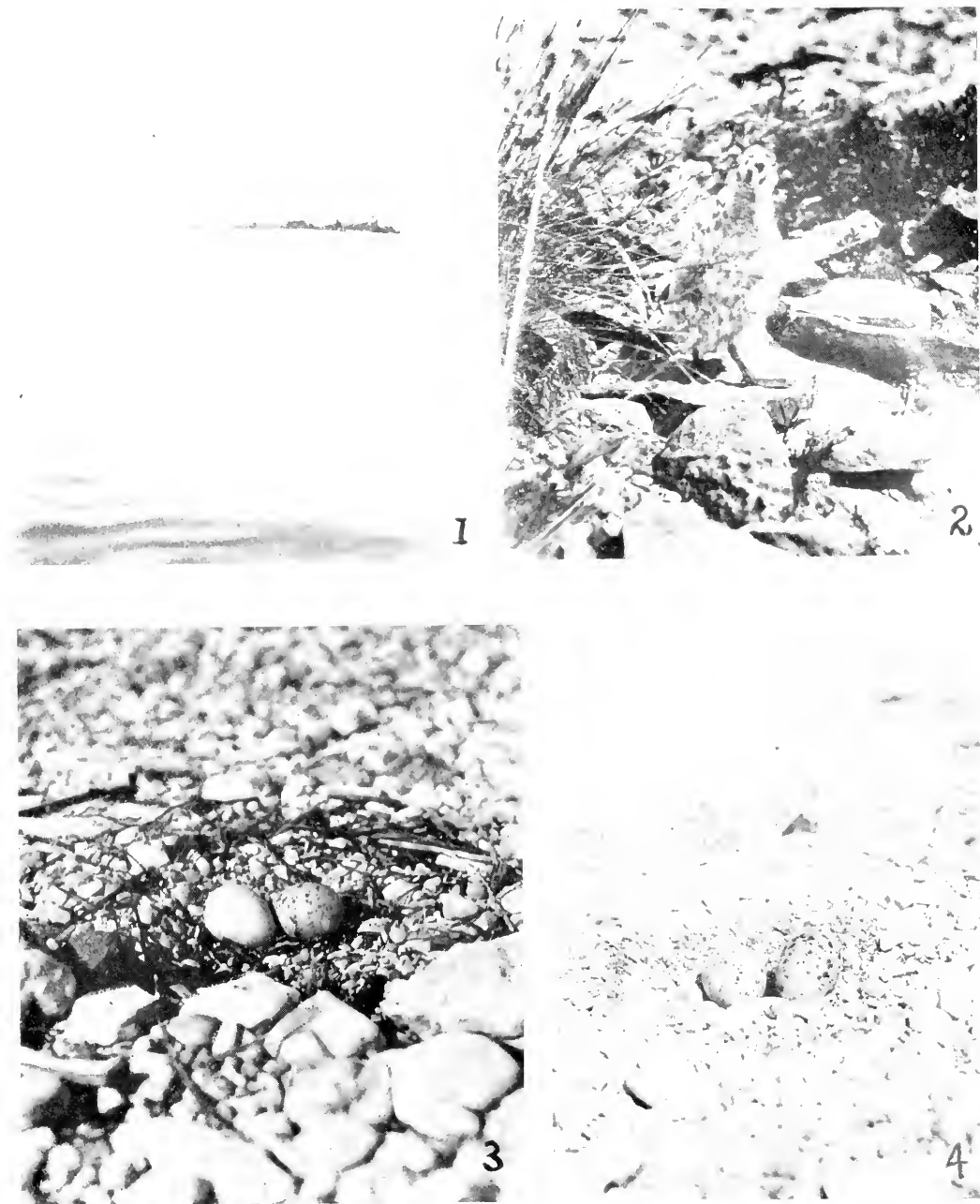
On returning later, the whole colony was seen to be still on the wing, shrieking and screaming above the breeding ground. The cause was soon revealed. In the midst of the colony was a fisherman methodically gathering the eggs from the nests. The old fellow could scarcely understand English and after much difficulty, it was explained that some of the

nests were to remain undisturbed. The birds were now so thoroughly alarmed that an hour spent in the hiding-tent in the hope of photographing them proved vain and the remaining hour or so of light was expended in examining and photographing the nests and eggs. An adult Caspian Tern was collected together with some clutches of eggs. A fair portion of the colony had not been disturbed. It was hoped that the next visit would find the owners of these nests back at the task of incubation and so the hiding-tent was left in position, as carefully concealed as possible.

On July 13, Pelican Island was re-visited. The birds were observed as before, resting on the rocks and along the shore. On approaching the breeding ground, the usual alarm of the parent birds was not in evidence and closer examination showed that every remaining egg had been destroyed—evidently by crows (*vide infra*) and on the whole spot not a single occupied nest remained. A specimen of Parasitic Jaeger and two still occupied Herring Gull nests were also discovered during this visit.

Reference to the published records of Manitoban birds yielded only an isolated record of the Caspian Tern. It is not mentioned by Bell (3) nor by E. Thompson Seton (11 and 12) and is recorded only by Nutting (6) whose record is cited by Preble (7). Nutting collected a single Caspian Tern on Lake Winnipeg at the mouth of the Saskatchewan river in 1892. The A.O.U. Check List (1) says of the Caspian Tern: "Range nearly cosmopolitan" but gives few North American breeding records, viz: "Great Slave Lake, Klamath Lake, Oregon, on islands of northern Lake Michigan, on coast of Southern Labrador, and also on coasts of Texas, Louisiana, Mississippi and (formerly) Virginia". The discovery of such a colony in Lake Winnipeg is, therefore, of unusual interest.

Although there are no published records of the species breeding in Manitoba, we have reason to believe that it was previously recognized by Mr. Eric Dunlop, since killed in action in France, a naturalist who in 1914 and 1915 collected in northern Lake Winnipeg for the Carlisle Museum, Carlisle, England. Dunlop is said to have found the Caspian Tern breeding on the west coast of Reindeer Island, but, unfortunately, his records are not available. While in the north, the authors met with Dunlop's chief guide, Capt. Goodman, who through his work with Dunlop had become acquainted with many of the birds. Capt. Goodman stated that in 1914 the Caspian Terns were found breeding only on the west shore of Reindeer Island and had not been noted anywhere else although numerous islands, including Pelican Island, were then visited.



1. Pelican Island. The shingle spit upon which the ternery was situated is visible in the foreground of the island.

2. Young Herring Gull. The rocky character of shore adjacent to the ternery is here shown. July 8, 1918.

3. Caspian Tern's nest showing remarkable variation in eggs of single clutch. Also exceptional in its employment of drift to form a "nest".

4. Typical nest of Caspian Tern. Note entire absence of vegetable nesting materials.

The Caspian Terns' nesting ground was a compact area situated on a slope of the shingle spit and measured only some 20 yards by 30 yards. The ternery sloped from some 10 to 12 feet above lake level at the highest point down to some four feet above lake level at the lowest point. In this space were well over 200 nests. Somewhat over 400 eggs were noted and exact measurements taken of 46 of them. A small, peculiar pond to the west of, and some 10 yards from the boundary of the ternery, contained a few water plants and algæ and was well populated with large frogs (*Rana pipiens*). This pond showed every evidence of being much visited by the birds. Between 600 and 800 adult Caspian Terns must have been observed on the first visit, the birds resting on the stones along the shore, fishing off-shore or flying together with Herring Gulls and Common and Forster Terns above the island. The stomach of the individual shot contained remains of small fish. The identity of the species was first suspected from the size and shape of the eggs, later determined by close range observation from the hiding-tent and finally confirmed by the finding of dead specimens and the shooting of an adult female.

The nest frequently consisted of mere depressions in the shingle, absolutely no vegetable or other materials being utilized. In some other instances, grass bents, dead rushes, bits of drift, etc., were gathered together forming a rude, basin-shaped structure. Thus the type of nest appears to resemble most closely that of Lesser Tern (*Sterna minuta*) (9) and not that of the Common Tern (*Sterna hirundo*) (10) which most frequently builds quite a noticeable nest of gathered materials. The deserted and much better constructed nests of Herring Gulls were occasionally used by the Caspian Terns, apparently no additions or alteration being made by the new tenants. In no case did the number of eggs in a nest exceed two. Frequently, there was only one egg, usually fresh, in a nest. It is of interest that Van Winkle (5) records three as the usual number of eggs per nest on the Gravel Gull Islands, Lake Michigan, whereas we found that in some cases where there were two eggs in the nest, they were both in such an advanced stage that there would have been ample time for the third egg to have been laid had three been the normal number of the clutch.

The eggs exhibited a considerable range of variation in color, size and type of marking, but destruction by the fishermen and the crows prevented the taking of a series of measurements similar to those made by Rowan, Parker and Bell (10) as was originally intended. The measurement of a char-

acteristic series of 46 eggs was fortunately secured, from which the following data were obtained:

Average length, 63.59 m.m.; average breadth, 43.84 m.m.; greatest length, 72.00 m.m.; shortest length, 56.00 m.m.; greatest breadth, 46 m.m.; least breadth, 41.00 m.m.

The two eggs of a clutch sometimes differed considerably, though a sufficient number were not examined to allow of satisfactory statistical treatment. Thus: in clutch No. 33 the two eggs were 70 x 46 and 67 x 45 m.m.; in clutch No. 23 the two eggs were 66 x 45 and 63 x 43 m.m.

Like differences were found also in color, for in one nest one egg was of a pale blue background with a few very faint spots, while the second was heavily spotted and blotched with black upon a brown background. The eggs that were opened and examined exhibited every stage of development from practically no incubation, the primitive streak stage, through to large embryos. The majority, however, were fresh. None seemed less than a week from hatching.

THE PARASITIC JAEGER.

The Parasitic Jaeger (*Stercorarius parasiticus*) of which a specimen was found on July 23 on the north end of Pelican Island, is also a bird of some interest as it is the first record for this area. The Canadian Catalogue of Birds (Macoun, 5) gives the following record for Hudson Bay: "a specimen of the melanistic form (of *Stercorarius parasiticus*) taken at Fort Churchill, Hudson Bay, 1845 (Dr. Gillespie, Jr.)" Preble (7), however, records the species as occurring on the coast of Hudson Bay, below Cape Eskimo in 1900. Both of these, however, are on the sea-coast and at least 500 miles north of Pelican Island. The two other members of this strange genus, the Pomarine Jaeger (*Stercorarius pomarinus*) and the Long-tailed Jaeger (*S. longicaudus*) have been recorded for Manitoba, the former on Hudson Bay (Preble, 7) and the latter once from Aweme, Man., May, 1903, by Mr. Norman Criddle (Macoun, 1909) and also once from Clandeboye, Man., October, 1902, by Atkinson (2).

The specimen of Parasitic Jaeger which the authors discovered was lying dead on the rocky ground above the drift line in the midst of a deserted Herring Gull colony. The individual was an example of the white phase. From the situation and appearance of the bird it is possible that it had been killed by Herring Gulls while poaching on the colony, a fate several times recorded for this species.

OTHER BIRDS.

The following observations were made concerning other species of birds noted on Pelican Island: HERRING GULL (*Larus argentatus*). This species

had practically completed breeding. Over 300 deserted nests and but four occupied nests were discovered—three with well-grown young and one with eggs.

RING-BILLED GULLS (*Larus delawarensis*) were noted in company with the last species.

FORESTER'S TERNS (*Sterna forsteri*) and COMMON TERNS (*Sterna hirundo*) were numerous, almost equalling the Caspian Terns in numbers. The gulls and terns all consorted together freely.

BLACK TERNS (*Hydrochelidon nigra surinamensis*) were entirely absent although they are quite numerous in the south end of Lake Winnipeg.

WHITE PELICAN (*Pelecanus erythrorhynchos*) were not noted, although excreta and two humeri were found. However, the species was regularly observed fishing in Swampy Bay, five miles from Pelican Island, so it probably is a frequent visitor here also.

SCAUP DUCKS (*Marila marila* or *M. affinis*) were observed, five or six individuals together, resting on the water not far offshore from the ternery.

MALLARD (*Anas boschas*) were observed and one adult female collected.

WHITE-WINGED SCOTERS (*Oidemia deglandi*) are frequently caught and drowned in the fishermen's nets. They probably visit Pelican Island frequently.

Two or three LEAST SANDPIPERS (*Pisobia minutilla*) were observed on the beach.

LESSER YELLOW-LEGS (*Totanus flavipes*) were seen feeding along the water-edge.

A PECTORAL SANDPIPER (*Pisobia maculata*) was shot out of a flock of five feeding near the ternery.

Several SPOTTED SANDPIPERS (*Actitis maculata*) were found feeding along the shore.

NIGHT HAWKS (*Chordeiles virginianus*) were noted at Swampy Bay and very probably inhabit Pelican Island. None was observed probably because both visits were made during daylight hours.

CROWS (*Corvus brachyrhynchos*) were common on the island. When the ternery was first visited, the crows gathered near at hand to watch the proceedings. When the second visit was paid, the crows were disturbed from the area of the ternery itself, where they were engaged in eating the Caspian Terns' eggs. The crows appear to feed largely upon the dead fish cast up by the water and they were constantly observed patrolling the shores in search of such food. Nests were found in considerable numbers.

SAVANAH SPARROWS (*Passerculus sandwichensis savanna*) were in song and apparently breeding near the ternery.

CEDAR WAXWINGS (*Bombicilla cedrorum*) were common in the trees on Pelican Island. They were

still in flocks and had not yet, apparently, begun nesting.

RED-EYED VIREOS (*Vireosylva olivacea*) were noted here as they were on every island and bit of the wooded shore the authors visited during the whole trip.

YELLOW WARBLERS (*Dendroica aestiva aestiva*) were common and breeding.

BLACKBURNIAN WARBLERS (*Dendroica blackburniae*) were noted and were in full song.

The discovery of the Caspian Tern Colony on Pelican Island is especially interesting in the light of our knowledge of the distribution of this bird. The A. O. U. Check list (1) gives the winter range of this species as "South Atlantic and Gulf Coasts". To and from this region, logically, the Pelican Island terns must each year journey; yet there is not a single record of a Caspian Tern being collected in Central or Southern Manitoba. The route of migration that would seem most reasonable is that down the Red-River-Mississippi Valley chain, yet this absence of records proves fairly conclusively that the Caspian Terns do not regularly or in numbers, traverse this path. The alternative suggestion is a migration route by way of Hudson Bay, thence to the Atlantic coast and thence southward. The Pelican Island and Reindeer Island colonies might thus possibly be explained as an invasion of this species from Hudson Bay, these islands—the outliers of the numerous islands including Berens Island—being the first of the group upon which the species has established itself. The birds in going to their winter range, still probably use the old route of invasion and travel circuitously out by way of Hudson's Bay and the Atlantic coast. Analogous to this might be cited the case of the Bobolink (*Dolichonyx oryzivorus*) which, according to Cooke (4) has invaded Utah by extending its range far westward, then southward yet in returning to its winter home in southern Brazil, the Utah bobolinks do not go directly, but move along their old invasion route, i.e., they first journey northward, then eastward, then they turn south to their distant winter range. It is conceivable that in the case of the bobolink, a frequenter of damp meadows, its choice of route is partly, perhaps largely, determined by following such suitable localities and therefore it does not cross the arid regions to the south and southeast of the points reached in its new advance. Indeed it is only since the extension of irrigation in certain parts of Utah that it has made its appearance there. Whereas the Caspian Tern, having once got into the lake region has practically an unbroken inland water system over which it could return to the south.

The Pelican Island colony is declared by the

fishermen, who recognize the Caspian Tern to be a new bird on the lake, to date within the last few years. Indeed the earliest definite information regarding it was their report that three years previous to our visit, a wolf crossed to Pelican Island from Swampy Bay and destroyed all eggs and young birds in the colony. The species was not found by Dunlop when he visited the island in 1914 and it is hardly possible that he could have missed it had it been there. Capt. Goodman stated that, on Reindeer Island, Dunlop found the Caspian Terns breeding as late as mid-August.

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DOUGLAS FIR SUGAR

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Much interest has recently been aroused over what appears to be phenomenal deposits of sugar on the leaves of Douglas fir (*Pseudotsuga taxifolia*) in certain areas of British Columbia. Although Douglas fir sugar has been known to the Indians of the dry-belt for many years, its occurrence seems to have been overlooked by the numerous surveyors and others who have travelled in the province; at least, in-so-far as the writer is aware, no record has been made of its occurrence previous to 1915, when an illustration appeared in the British Columbia Botanical Office Report for the year 1914, showing a branch of Douglas fir laden with white masses of sugar. This photograph was prepared from specimens received from Mr. Jas. Teit, of Spence's Bridge, B.C., who, in connection with his ethnological work on the plants used as food by the British Columbia Indians, wished to have an explanation of the deposits; Mr. Teit also forwarded samples of Douglas fir sugar to Dr. E. Sapir of the Geological Survey of Canada, who had the samples analyzed.

During the summer of 1917, when the European conflict caused an increase in the cost of living and the introduction of measures to economize sugar, interest in this phenomenon was renewed and intensified by the appearance of a glowing account supplied to one of the Vancouver newspapers by some irresponsible contributor. As a result, a number of people became quite enthusiastic regarding

this "new" discovery and hastened to ascertain its commercial possibilities.

In view of the fact that many people in Canada are interested in the phenomenon, and at the request of Mr. Teit, the writer consented to give a summary of what is known regarding Douglas fir sugar and the factors influencing its exudation as deposits on the leaves. All the information relating to the distribution and habitats of sugar-bearing Douglas firs was supplied by Mr. Teit who, being resident in the heart of the dry-belt and having an intimate knowledge of the Indians of the interior, was best able to secure the necessary data.

It appears that Douglas fir sugar cannot be relied on as an annual crop. Some years it is abundant, other years little or none is found. It is therefore regarded by Indians as an extra, rather than a necessary part of their food supplies, but when available in quantity it is collected and may be kept for future use.

NOT THE WORK OF INSECTS.

Previous to having seen the specimens, the writer suspected that the sugar had been produced as an exudation on the leaves through punctures made by insects possibly aphides; such as is said to occur on *Tamarix mannifera* which, when attacked by a *Coccus*, yields a kind of mucilaginous sugar—the manna of Mt. Sinai; but information to the effect that only healthy trees produced the sugar and that such trees were practically free from insects,

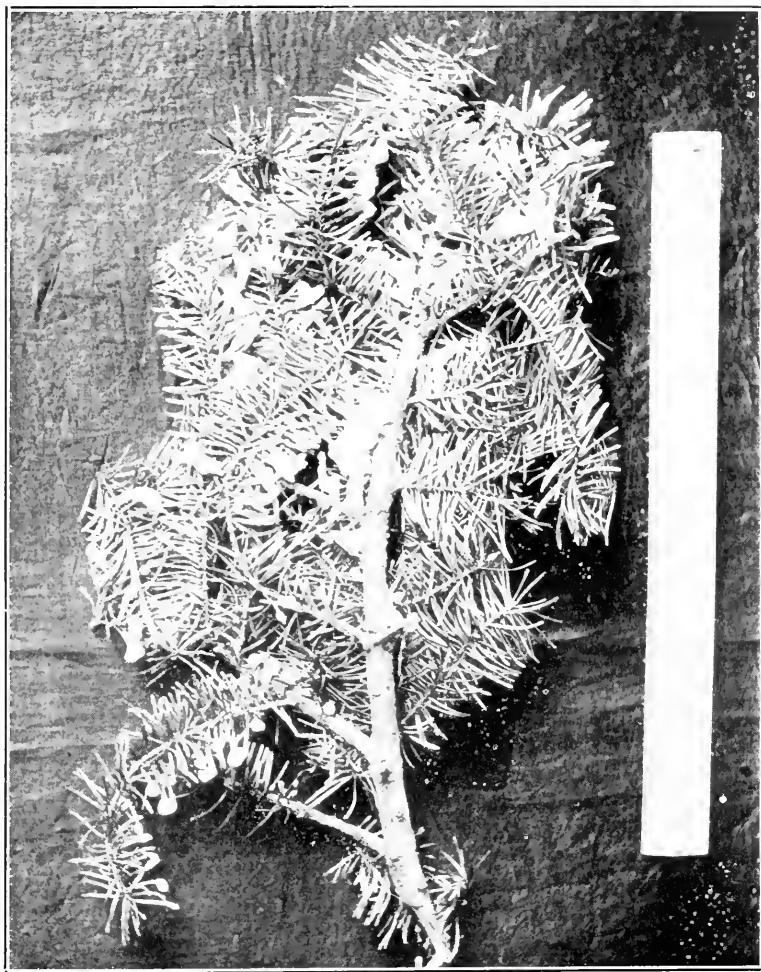
with the exception of such as were feeding on the sugar, led one to suspect that the sugar might be related to the manna of commerce, obtained from several species of ash (*Fraxinus*) as an exudate which assumes the form of flakes or fragments.

When specimens were received, however, in the summer of 1914, it was seen that none of the previously recorded sugars corresponded with the pe-

and pending the results of the analysis which was then being carried out by Dr. F. T. Shutt, Dominion Chemist, at Ottawa.

APPEARANCE OF THE SUGAR.

The sugar appears as white masses varying in size from $\frac{1}{4}$ of an inch to $1\frac{1}{2}$ or 2 inches in diameter. The smaller masses are formed like white drops at the tips of single leaves, occasionally two or three



Branch of Douglas fir laden with white masses of sugar.
(From B. C. Bot. Office Rep., 1914).

culiar masses formed by Douglas fir. A careful search for information as to its chemical analysis revealed nothing to show that even its occurrence was known. On account of its interest and novelty at the time, the photograph in the Botanical Office Report was supplied to record its occurrence and illustrate the phenomenon, pending an investigation into the circumstances under which it was formed,

leaf-tips are imbedded in larger drops, while the largest masses are usually scattered irregularly over the leaves and branchlets.

The sugar tastes decidedly sweet, passing temporarily into a pasty consistency during dissolution in one's mouth; it is completely soluble. When collected it is quite hard and dry, with no tendency to be sticky. A slight rain is sufficient to dissolve the

sugar off the trees, and patches of recrystallized sugar may then be found at the base of trees or on the ground. Frequently, however, in this situation it does not recrystallize but may be found in a fluid or semi-fluid condition which is attractive to flies and other insects. Sometimes, as above mentioned, insects feed on the sugar while still on the trees, and it is reported that bears go after it, causing the breakage of many branches.

EXUDATIONS BY OTHER PLANTS.

As is well known, many plants have structures known as waterpores, situated usually at the tip or apex of the leaves, and, in the case of lobed leaves, often at the tips of the lobes or teeth along the margin. Occasionally when the root-pressure is very active, so much water is forced up into the plant that the leaves become gorged with water which escapes through these water-pores—comparable to a kind of safety valve. Most people are familiar with the drops of water at the tips of grass leaves in the morning after a hot dry summer day and a cool, clear night, giving origin to the Scotch saying, "Ilka blade o' grass keeps its ain drap o' dew".

In some localities, where the soil is calcareous, minute white incrustations of lime are found around the water-pores; these incrustations may be found on grasses, and are of common occurrence on certain species of Saxifrages which show them on every tooth along the margin of the leaves, such incrustations are small, and are only formed under certain ecological conditions, in which temperature of the soil and atmosphere, and water content of the soil are important factors.

FACTORS INFLUENCING EXUDATION OF SUGAR.

A review of the distribution, and various factors influencing the production of sugar by Douglas fir, will prove of especial interest to physiological and ecological botanists, to whom the phenomenon will serve as a splendid illustration of the influence of environment on a plant which under ordinary conditions in British Columbia does not exude sugar.

DISTRIBUTION.

The region in which sugar-bearing Douglas firs are most abundant, lies between the 50th and 51st parallels and between 121°-122° long. This includes the driest and hottest part of the dry-belt of British Columbia. Within this area they are rather common in the Thompson valley west of the mouth of the Nicola river, also near the junction of the Thompson and Fraser rivers at Lytton; they have been found a little above Lilloet in the Fraser valley, but according to present information are not known to occur north of Clinton in this region.

About 10 miles north of the apex of the angle formed by the junction of the Thompson and

Fraser rivers, lies Betani valley, at an altitude of between 3,500 and 4,000 feet, some years sugar is comparatively abundant on trees in this region; the geology and flora is very different from that of the adjacent Thompson or Fraser valleys; here one may find sugar-bearing Douglas firs growing on the southern and south-western slopes having the greatest sun exposure. The soil produces a thick covering of grass and other vegetation, indicating a plentiful supply of available soil moisture; differing in this respect from the dry gravelly southern and south-western slopes of the main valleys of the Fraser and Thompson.

Suitable habitats are found at intervals over a considerable area of the dry-belt regions, in addition to samples received from the north and south sides of the Thompson river near Spence's Bridge, Douglas fir sugar has been reported from around Kamloops and Savona, also from the Nicola and Similkameen valleys, and is said to be found in the southern part of Okanagan valley. In-so-far as the chief of the Kootenay Indians is aware, it is not known in the Kootenay country although it is reported by an Indian as being found in eastern part of Washington state, United States.

HABITATS.

The habitats in which sugar-bearing firs are found, are usually on gentle slopes facing east or north in that region of the dry-belt where the Douglas fir is encroaching on the dry-belt flora. The trees are in comparatively open areas with abundant exposure to the sun.

SOIL MOISTURE.

As a rule, sugar is not found on trees situated on fully exposed southern or western slopes, nor on areas where Douglas fir forms a dense forest. Southern and western slopes, exposed to the full heat of the sun, dry out much sooner than ground gently sloping to the east or north; the greater abundance of soil moisture in the latter is a point to be kept in mind.

ABUNDANT SUNSHINE.

In the region above mentioned the descending zone of the Douglas fir and the ascending zone of yellow pine overlap, so that the trees are well exposed to the sun, not being so crowded as to limit the foliage to a narrow crown, as happens in dense forests. An abundance of leaves exposed to the sun will result in an abundant formation of carbohydrates during the day; under ordinary conditions these carbohydrates would be removed from the leaves and transported to growing tissues or storage tissues during the night. This normally takes place in most plants, including Douglas fir in its natural habitat in the coast area where it forms dense forests of gigantic trees.

TEMPERATURE OF SOIL AND AIR.

In the dry-belt area it is evident that Douglas fir trees are exposed to the sun for a greater number of hours per day, the soil and atmosphere is warmer, the forests are more open, with freer circulation of air, than Douglas fir forests in the coast area.

MAXIMUM ROOT-PRESSURE.

It appears then that in years when Douglas firs are fully exposed to a long succession of hot, cloudless days in midsummer, and provided with the requisite soil conditions (i.e., temperature and available water) the trees gradually accumulate an excess of carbohydrates during the many hours daily exposure to sun, the increasing temperature of the soil enables the cells of the roots to maintain or increase their activity during the night, which in dry-belt regions in midsummer is very short, and during which root-pressure is at its maximum.

DRY ATMOSPHERE.

When night comes on, the chlorophyll-containing guard-cells have ceased photosynthesis, the guard-cells become isotonic (i.e., of equal concentration) with the surrounding cells, and the stomata close; so that even during warm nights little evaporation can take place from leaves so well protected with cutin. As a result of the increased root-pressure and cessation of transpiration the leaves become gorged with water in which the sugar—formed by the re-conversion of starch into sugar—is dissolved and exuded as drops at the tips of the leaves. The warm dry atmosphere at that time of the year causes the rapid evaporation of the water, leaving the sugar in the form of drops of various sizes as a deposit at the tip. Occasionally two or three such drops come in contact with each other and fuse to form one large drop, frequently they become so large that they fall from the leaf tips onto the leaves or branches below; a succession of these large drops cause the formation of the larger irregular deposits referred to above.

There is no doubt about the exudation of the sugar from the leaf-tips; deposits may be found in all stages, from mere traces up to large drops, in some cases just dried as they were about to fall.

With a knowledge of the ecological conditions under which Douglas fir exudes sugar, one can understand why it may be rare or absent in some years; one or two dull, cool, or wet days would suffice to alter one or more of the factors which play a necessary part in promoting its exudation. A dull day would enable the tree to utilize much

of the excess sugar or store it as starch or other reserve food. A cool day would diminish the activity of the sugar forming cells in the leaves, and by lowering the temperature of the soil would lessen the activity of the roots, thus diminishing the root-pressure and exudation of water, while a wet day and subsequent evaporation from the soil would more effectually lower both the soil and atmospheric temperatures. Other factors would be affected, but the above summarizes the main points.

ANALYSIS OF THE SUGAR.

The results of Dr. Shutt's analysis of two samples—one supplied in 1914, the other in 1917—indicate a high degree of constancy of composition of Douglas fir sugar.

The preliminary analysis made in 1914 gave the following results:

Total sugars after hydrolysis -----	96.25%
Reducing sugars -----	23.3

The analysis of the 1917 sample furnished the following data:

Total sugars after hydrolysis -----	91.91
Reducing sugars -----	24.86
Foreign matter, etc., insoluble in water -----	.64
Moisture -----	7.00

Subsequent to the analysis, a contribution* from the Carbohydrate Laboratory of the Bureau of Chemistry, U.S. Department of Agriculture, Washington, D.C. a laboratory especially equipped for the examination of saccharine substances, reports a complete analysis of the same product.

A summary of their findings is as follows:

"The sample of Douglas Fir manna yielded about 50% of pure crystalline melezitose, and there is evidence that the manna contains sucrose and some reducing sugar probably a mixture of glucose with a smaller quantity of fructose. The percentage composition of the sample of dry manna that we examined was approximately:

Melezitose -----	75-83%
Sucrose -----	2.9%
Reducing Sugars -----	11.5%"

Melezitose is an extremely rare trisaccharide of the formula $C_{18}H_{32}O_{16}$ which on hydrolysis yields glucose and turanose, the latter is very difficultly hydrolysed to glucose and fructose but in the conventional methods of sugar analysis, the only product of hydrolysis having direct reducing action is glucose.

*The Occurrence of Melezitose in a Manna from the Douglas Fir, by C. S. Hudson and S. F. Sherwood (Journal of the American Chemical Society, Vol. XL, No. 9, 1918).



MUSEUMS AS EDUCATIONAL INSTITUTIONS.

BY M. Y. WILLIAMS.

Ask the average Canadian to name our educational institutions and it is scarcely likely that "Museums" would be included in the list. Ask a dweller in New York City the same question, and if he omitted "Museums" he would show that he failed to appreciate the advantages at his very doors.

Modern pedagogy recognizes the importance of studying objects rather than the description of objects; the modern museums display, in instructive and attractive manner, things gathered from the great and wonderful world around us. We have primary and secondary schools, and higher up are the colleges and universities, but museums include among their attending students the toddling infant, and the grey-haired patriarch.

Let us consider some few of the things which great museums have to teach us. One of the newest as well as one of the greatest of the museums on this continent, is the American Museum of Natural History, situated in New York City. Its exhibits are multitudinous and truly impressive. Who can view understandingly the wonderful mounted specimens of the reptilian monsters of the dim geologic past, without having a broader, more profound, more accurate view of the brief moment of time in which we live? Who can stand before those creations of art, the background bird groups, without having a better understanding and appreciation of the beauties of our bird life in its natural setting? Such work is as truly the work of the artist, as are paintings and statues! The wonderful array of minerals and the priceless collections of gems and precious stones illustrate the best that the rocks have to reveal. As wanderers from outer space, there are to be seen some of the largest meteorites known. Among them are included Peary's wonderful specimens from Greenland, one of which is as large as an explorer's tent.

And what of the National Museum at Washington? Few will fail to recall the wonderful groups of American aboriginals, transfixed as it were near their habitations in the midst of their daily tasks, with their implements, and food supplies nearby; nor can the fine groups of African game animals be forgotten, including rhinoceros, buffaloes and lions, collected by Colonel Theodore Roosevelt.

From the Field Museum of Natural History, Chicago, the visitor carries away a better understanding and clearer picture of African antelope, hyenas, zebras and leopards in their natural habitat than pages of descriptive writing could have given.

The Milwaukee Public Museum takes the visitor back to the days of early colonial life in America, and depicts a street scene, say in Massachusetts, with small frame houses, homemade furniture, dove cotes, and people dressed in simple homespun. Fine groups of mammals and birds and many other exhibits are there, but the colonial village is unique.

The New York State Museum at Albany illustrates in wonderfully realistic form, the early fish-like creatures of the geologic past, and one of the earliest trees known from fossil remains. The Iroquois Indian groups, prepared from Indian models, under the direction of a Mohawk Indian, perpetuate the memories of Indian life as it was when Champlain was founding Canada.

And there are other great museums at Pittsburg, Brooklyn, Boston, Philadelphia, and elsewhere, all teaching their lessons to the visitor. Volumes could be written descriptive of them, each writer depicting those exhibits which appeal to him most.

It must not, however, be supposed that the public exhibits make up the entire museum, nor that all specimens are placed on exhibit. Great as is the popular educative value of exhibits, many specimens must also be preserved for comparison and study by specialists and research students. Zoological specimens generally fade when placed on exhibit, and groups of mammals, birds and insects have to be replaced by new material from time to time. So it happens that for every specimen on exhibit hundreds or in many cases thousands of valuable specimens may be carefully stored away, where they are available for study, or to replace other exhibits.

Besides the exhibitions and the special researches carried on by modern museums, lecture halls are provided, where members of the staff lecture to students from schools and colleges and to the public in general.

So far reference has been made to the museums of the United States only; let us now turn to the museums of Canada. Among these are the provincial Museum of British Columbia, at Victoria, the Banff Park Museum, the Redpath Museum of Natural History at McGill University, Montreal, the Museum of the Natural History Society of New Brunswick at St. John, the Royal Ontario Museum at Toronto, and the Geological Survey Museum housed in the Victoria Memorial Museum at Ottawa.

The British Columbia Museum is particularly mentioned by visitors because it contains a complete collection of the game animals of the province. The Banff Museum appeals to tourists because of its

game exhibits. The Redpath Museum contains a variety of collections, dating back over many years, and is a storehouse of valuable study material for McGill University. The Museum of the Natural History Society of New Brunswick, at St. John, emphasizes the direct instruction side of museum work, and, although possessed of limited resources, with the co-operation of the railways, places timely exhibits before the people by means of museum cars.

The Royal Ontario Museum at Toronto has, within the last six or seven years, assumed the leading position in Canada on account of its exhibits. It contains a number of very interesting features, among which are its collections of oriental arms and armor, its antique furniture and musical instruments and its well arranged collections of minerals and invertebrate fossils.

Our national institution, the Geological Survey Museum housed in the Victoria Memorial Museum at Ottawa, contains the exhibits long housed on Sussex street, including all the collections made by the Geological Survey since its founding by Sir William Logan in 1842. The collections of indian clothing, weapons, works of art, and utensils are very complete and fine, and could not be replaced. The herbarium represents collections from all parts of the country. The zoological collections contain specimens of most of the species of the vertebrate fauna of Canada and in some lines it is very complete. About 13,000 bird skins are catalogued and carefully stored for study, and the game and fur-bearing mammals are represented by many specimens.

It is in palæontology, however, that the Geological Survey Museum ranks especially high. All the type specimens described by the noted Canadian palæontologists, Elkanah Billings and J. F. Whiteaves (that is the specimens which were first studied and upon which the species were founded) are contained in the invertebrate collection, along with the types of more recent workers, and thousands of valuable specimens gathered from all parts of Canada during 75 years of exploration. In vertebrate palæontology, many fine specimens represent the huge creatures of past geologic ages, and the Cretaceous dinosaurs from the Red Deer Valley of Alberta form a collection second only to that of the American Museum of Natural History, New York. These were obtained during the past six years by the veteran collector, Charles H. Sternberg and his sons, and were being described by the late Lawrence M. Lambe.

There are also the ores and minerals of Canada, of which we may be justly proud. Specimens have been collected from all parts of the country and a very good display of these is now being placed on exhibit in the economic museum of the Geological Survey, at 227 Sparks street.

It is not to be supposed, however, that because of the collections already made, that nothing is left to be done. A museum must be a growing concern like all other institutions that possess life and a future. Dr. W. T. Hornaday has said that the British Museum surpasses all other museums because a devoted nation has for generations collected trophies and specimens for it from all corners of the earth. It remains for Canadians to give their Museum such support that it may be made and kept, an object of sustained national pride.

Specialists have been appointed to take charge of the various divisions of natural history and a fair start had been made in arranging public exhibits when the Parliament Buildings were burned. The Museum building was needed for Parliament and all museum material had to be hurriedly packed and stored. Thus, so far as the public is concerned there has been no National Museum for the past three years. The preparation of exhibits has continued but has been much curtailed by lack of space. Plans are ready however for placing many fine exhibits in the halls as soon as the building is once more made available for museum purposes.

Let us picture to ourselves what the museum may some day be like. The Ethnological hall is intact and with its wealth of aboriginal material may be reopened on short notice. The hall of fossil vertebrates may be quickly rearranged, so as to display its huge reptilian monsters, early mammals, birds, and fishes—altogether a suggestive chapter of the geologic past. The wonderful collection of fossil shell fish and other inhabitants of the early seas when arranged according to formations and biologic groups will be one of the best assemblages of its kind in America. The contemplated bird group, representing the avifauna of southwestern Ontario (the extreme southern tip of Canada), should fascinate all bird lovers. Musk ox, moose, polar bear, beaver and other groups of our big game and fur bearing mammals are planned and some are partly executed. These with scenic backgrounds and natural accessories, should be a source of education and delight to all lovers of nature, and to sportsmen especially. For the miner and mineralogist there will be systematic collections of minerals and rocks, models of mining camps, and maps and plans of mines. For the botanist there is the herbarium, for the entomologist the insect collections and so on.

In short, with the specialists who are in charge and with the nucleus of a great collection already on hand, effective, popular support expressed through Parliament is all that is needed to make our museum in the near future something to be proud of, an educational institution, teaching effectively all branches of the natural history of Canada.

THE BIRDS OF SHOAL LAKE, MANITOBA.

BY P. A. TAVERNER.

(Continued from page 164 of THE OTTAWA NATURALIST, Vol. XXXII.)

103. *BLACK-BILLED CUCKOO, *Coccyzus erythrophthalmus*.

Job reports seeing this species on the western side of the lake on June 27 to 30, 1912. We saw none in 1917 though we heard rumors of cuckoos having nested in the vicinity. In 1918 the Black-bill appeared on June 14, after which Young noted a few birds almost daily to August 1.

104. BELTED KINGFISHER, *Ceryle alcyon*.

Strangely enough, on the borders of such a fine lake we saw no kingfishers in 1917, though Young reports one on May 2, 1918. The Ward brothers say that in previous years there were always a few about, and Seton reports a specimen taken by Miller Christy on May 15, 1887. The only explanation of their present absence seems to be the lack of fish caused by the extreme alkalinity of the lake at its present level.

105. *HAIRY WOODPECKER, *Dryobates villosus*.

Rather rare. Only two seen during the spring visit and one in September of 1917. Young noted the species, in 1918, in limited numbers, from June 3 to Sept. 26, taking juveniles but recently from nest, so it doubtless breeds in the vicinity. Five of our specimens are clearly referable to *D. v. leucomelas* though one, Sept. 22, 1917, falls slightly short of *leucomelas* measurements.

106. *DOWNY WOODPECKER, *Dryobates pubescens*.

Several seen during the spring of 1917, but none in the autumn. Observed by Young in 1918 in small numbers from May 3 to Sept. 12.

107. *YELLOW-BELLIED SAPSUCKER, *Syphrapicus varius*.

Next to the Flicker the commonest woodpecker. Several nests were found and the species was still present during the fall visit in 1917 and to the end of September, 1918.

108. RED-HEADED WOODPECKER, *Malanepres erythrocephalus*.

Though we have no substantiating evidence, the Ward brothers declare that they have seen one or two individuals. There should be but little mistake with such a showy and strongly marked species.

109. *FLICKER, *Colaptes auratus*.

Very common and breeding. Still present in 1918 to date of leaving Oct. 2. Young says that through September they were very busy feeding on ant hills.

110. *NIGHTHAWK, *Chordeiles virginianus*.

Very common in 1917. First arrival May 18. One seen on Sept. 17, but none thereafter that year.

The specimens taken seem to be *virginianus*. One is nearly light enough to be regarded as *hesperis* but as it can be matched by individuals from New Brunswick and central Ontario, I hesitate to so identify it.

111. *RUBY-THROATED HUMMINGBIRD, *Archilochus colubris*.

Quite common throughout the spring visit of 1918 and noted by Young occasionally in 1918 from June 1 to end of August.

112. *WHIP-POOR-WILL, *Antrostomus vociferous*.

Heard in 1917 nearly every night during the spring visit and once in the autumn, on Sept. 17. Young only observed it once on June 6 in 1918, but his difficulty in hearing would prevent his noting it very often.

113. *KINGBIRD, *Tyrannus tyrannus*.

First seen in 1918 on May 18; very common by the 29th. On Sept. 18 a flock of six were seen. Common in 1918 from May 17 to Sept. 10.

114. *PHOEBE, *Sayornis phoebe*.

One taken by Young, on Aug. 30, 1918, is our only record.

115. *CRESTED FLYCATCHER, *Myiarchus crinitus*.

In 1917 only one was seen, June 1. In 1918, Young noted it twice in early June, three times in July, and once in September. The Ward brothers say that in 1916 Frank McGiffon took a set of eggs locally.

116. OLIVE-SIDED FLYCATCHER, *Nuttallornis borealis*.

In 1917 one reported on June 5 and one taken on the 14th. In 1918 Young noted several on June 4 to 9, and again a single bird on Aug. 17.

117. *WOOD PEWEE, *Myiochanes virens*.

Our only record for this species consists of two specimens taken by Young on June 18 and July 2, 1918. The former is a female and had an egg ready to lay, thus verifying the species as a breeder in the locality.

118. *YELLOW-BELLIED FLYCATCHER, *Empidonax flaviventris*.

One taken on Maple Island above the Narrows on May 30, 1917. As sight records unsupported by the ear are unsatisfactory in regard to the smaller flycatchers, citing the specimens taken by Young in 1918 is probably the better way of reporting his experience. He took specimens of this species on June 4 and Aug. 15.

119. *TRAILL'S FLYCATCHER, *Empidonax trailli*.

First seen on May 9, becoming almost common by the 14th. In 1918 Young took one on June 8. All specimens are referable to the Alder Flycatcher, *E. t. alnorum*.

120. *LEAST FLYCATCHER, *Empidonax minimus*.

In 1917 first seen on May 23. By the 30th they were common in all the bluffs. Young's experience in 1918 seems about similar. He took specimens from May 30 to July 31.

121. *HORNED LARK, *Otocoris alpestris*.

In 1917 very common during the spring visit, but only a few present in the autumn. In 1918, Young found them consistently common throughout his stay from late April to early October. On April 24 he found a large flock (100) in company with Lapland Longspurs. He obtained one specimen from it, a well-marked *O. a. alpestris*. All other birds taken are *O. a. praticola*. It is worth while noting, as a caution against taking assumed breeding dates as evidence of nesting, that only six days after the taking of the above evident migrant *alpestris* nearly fully fledged young of *praticola* were collected. Thus local birds had young out of the nest before more northern nesters had left for their breeding grounds.

122. MAGPIE, *Pica pica*.

The Ward brothers say that the Magpie occasionally occurs about Shoal Lake. They recall one seen in July and two in June, 1904. May 21, 1918, William Ward reported seeing one near camp, and a few days later Frank Ward had exceptional opportunities of watching another at Gimli on the shores of Lake Winnipeg, some forty miles east of us.

123. BLUE JAY, *Cyanocitta cristata*.

In 1917 fairly common in spring but not noted during the autumn visit. In 1918 Young noted the species until Sept. 28.

124. CANADA JAY, *Perisoreus canadensis*.

Said by the Ward brothers to be a winter visitor, coming sometimes as early as September, but less numerous of late years.

125. RAVEN, *Corvus corax*.

Said by the Ward brothers to be fairly common during hard winters.

126. *AMERICAN CROW, *Corvus brachyrhynchos*.

Very abundant. Residents do not complain much of its destructiveness to crops but it is certainly a great nest robber and its effects upon the ducks must be marked and serious. Amongst Young's specimens are two that he concluded from their actions to be mated, but, while the male is large even for *C. b. brachyrhynchos*, the female falls well within the measurements for *C. b. hespris*. Considering other Canadian prairie specimens with these, I do

not consider the two races satisfactorily differentiated.

127. *BOBOLINK, *Dolichonyx oryzivorus*.

In 1917 a few were seen on wet meadows in the spring, none in the autumn. In 1918 Young noted them from June 8 to Aug. 22. The residents say that occasionally they do some damage to grain.

128. *COWBIRD, *Molothrus ater*.

Very abundant. Noted by Young in 1918 to Sept. 7.

129. *YELLOW-HEADED BLACKBIRD, *Xanthocephalus xanthocephalus*.

The least common of the resident blackbirds. Occasional small flocks were found foraging here and there on the uplands, cultivated fields and dry marshes. In 1918 still scarcer than during the preceding season. It seems that this bird requires more extensive marshes than the Red-wing. In 1917 we found resident colonies in a few places while the Red-wings occupied every reedy slough. Young reports no breeding birds in 1918. His latest record for the species is Aug. 26. The juveniles in first winter plumage are quite similar to the adults but the white primary coverts are reduced to traces and the crown and hind neck concolorous with the back. In one specimen, a stripped plumage, similar to that of the juvenile Red-wing is just disappearing on the breast where it is being replaced with yellow of rather a deeper orange than that of the adult.

130. *RED-WINGED BLACKBIRD, *Agelaius phoeniceus*.

Very abundant, breeding in every suitable locality.

The A. O. U. Check List recognizes the Red-winged Blackbird of central North America as the Thick-billed Red-wing, *A. p. fortis*. This race Mr. H. C. Oberholser (*Auk* XXIV, 1907, pp. 332-336) further divides into northern and southern forms, calling the Canadian race *A. p. arctolegus*, extending its range east to Isle Royal, Lake Superior, and restricting *fortis* to the United States, south from Nebraska. As the A.O.U. Committee has not as yet recognized *arctolegus*, from the standpoint of the Check List, it can be regarded as a synonym of *fortis*. The diagnosis for *fortis* calls for a larger bird than *phoeniceus*, the eastern race, with a comparatively shorter, thicker bill. *Arctolegus* is characterized by its describer as a large *phoeniceus* with slight color differences in the female.

To obtain easily compared factors of shape and size, I have divided the length of the bill by the depth for an index of shape and multiplied them together for an index of size. The former gives the length in units of depth, and the latter a product that whilst more or less arbitrary in itself, when derived from specimens of the same species, should be strictly comparable with each other and representative of relative size, irrespective of the disturbing element of shape.

Comparing Shoal Lake birds with other material, I have made use of the following adult male material: 9 from Mass., southern Ont. and southern Mich.; 7 from Shoal Lake and two from Douglas, Man.; and 7 from Sask., Alta., and Mack. The measurements of these birds together with those similarly derived from Mr. Oberholser's paper above cited, tabulate as follows:

	Index	Index	Wing	Wing
	shape.	size.	average.	Min. & Max.
9. Eastern Canada.	1.9	245.1	121.7	(116.0-128.0)
7. Manitoba	1.96	264.4	124.4	(120.5-128.0)
7. Sask., Alta.,				
Mack.	1.8	229.2	127.2	(111.5-132.5)
10. <i>phoeniceus</i>				
(H.C.O.)	1.8	269.2	118.8	(114.0-122.0)
12. <i>arctolegus</i>				
(H.C.O.)	1.88	304.8	125.4	(121.5-130.0)
11. <i>fortis</i> (H.C.O.)	1.88	254.04	129.7	(125.0-134.0)

In color, I find Shoal Lake females showing a slightly greater amount of white below, most distinctly on the throat and upper breast, but the distinction is too slight and inconsistent for certain or individual recognition.

It will be seen that the difference in shape of the bills of these various strains is very slight, and in no case marked enough to warrant the title "Thick-billed", in fact Oberholser's *arctolegus* and *fortis* have more slender bills than *phoeniceus*, and the Shoal Lake specimens considerably exceed all others in this direction having minimum and maximum indices of 1.72 and 2.22.

It is also evident that whilst there is a slight increase in size of both bill and wing of this species westward over the prairie provinces, the difference is not so marked in the new material as in Oberholser's measurements: also that individual variation is almost as great as the racial distinction and is one of averages, leaving the bulk of individual specimens subspecifically unrecognizable by character. Such distinctions do not in the view of the writer form criteria sufficient for systematic separation and nomenclature. Irrespective of such judgment on the races concerned it is evident that these Shoal Lake birds are just about intermediate between eastern and west plains birds though personally I do not care to separate them from *phoeniceus*.

131. *WESTERN MEADOW LARK, *Sternella neglecta*.

Very common during all visits. The song of the Western Meadow Lark is justly noted. It is one of the most wonderful prairie sounds and its constant repetition and infinite variety is characteristic of the west. However, eastern ears may be pardoned for a little disappointment on first hearing it. If they expect to hear a glorified eastern Meadow Lark song they certainly will be disappointed. While it is a beautiful production it is not the song they have been accustomed to associate with the coming of spring. It has many charms of its own, but they are not familiar; in fact hardly a note suggests the

well remembered voice of the old eastern friend and until its source is traced, even an experienced ornithologist is apt to wonder as to the identity of the singer. It will, I think, take several seasons' experience with this species to build up a new set of associations and take it to the heart in place of the well beloved eastern harbinger of spring.

132. *BALTIMORE ORIOLE, *Icterus galbula*.

In 1917, arrived on May 23, common on June 2; not seen in the autumn. In 1918, arrived on May 16, the bulk disappeared on July 23, and the last one was seen on Aug. 6.

133. *RUSTY BLACKBIRD, *Euphagus carolinus*.

Not recognized in spring, but one was noted on Sept. 21, 1917; not recorded by Young in 1918.

134. *BREWER'S BLACKBIRD, *Euphagus cyanocephalus*.

Very abundant and nesting in nearly every open bluff. They follow the ploughman about his work gleaning from the newly turned furrow, and associate commonly with the sheep perching upon their backs and scrutinizing the fleece, probably for ticks. On Sept. 25, 1917, three were taken from a flock. Of these one female, seemingly an adult by its completely granulated skull, had the iris reddish-brown just flecked with straw. All other specimens taken had the usual straw-colored iris.

135. *BRONZE GRACKLE, *Quiscalus quiscula*.

In 1917 there was a thriving colony of Bronzed Grackles nesting in the willows just behind the Ward house until persevering work with a shot gun removed them, after which many more attractive birds of less questionable character were able to appropriate the premises. The Wards accuse them of doing considerable damage by killing young chicks. While I cannot substantiate this charge I have little doubt as to its truth. None were seen in the autumn of 1917, but Young noted the species as late as Sept. 27, in 1918.

136. *EVENING GROSBEEK, *Hesperiphona vespertina*.

In 1917 we saw two to four individuals, May 20, 24 and 25, and secured several specimens. I noted that the bills of these were as green as those of summer birds from British Columbia and quite different from the yellow mandibles of eastern mid-winter specimens. The difference is probably seasonal rather than subspecific. Unfortunately these are amongst the birds that were lost. In 1918, Young noted three and two Sept. 25 and 30.

137. *PURPLE FINCH, *Carpodacus purpureus*.

None noted during either spring. Two or three were seen on several days in a small growth of hawthorn in September. In 1918, Young noted small numbers from July 11 to Aug. 26, and a single individual on Sept. 25.

138. *GOLDFINCH, *Astragalinus tristis*.

None seen in spring until May 27, 1917, after which they became common and were still numerous in September. Young noted them in 1917 from April 29 to his departure on Oct. 2.

139. *PINE SISKIN, *Spinus pinus*.

In 1918 Young noted 5 on June 5, 2 on the 21st, and one Sept. 24, taking specimens on the first two occasions.

140. *SNOW BUNTING, *Plectrophenax nivalis*.

In 1918, Young found large flocks on his arrival on April 24, and saw them almost daily until May 24. After this, 5 were noted on the 22nd and one on the 28th. Specimens taken on April 21 and May 2 are in high breeding plumage.

141. *LAPLAND LONGSPUR, *Calcarius lapponicus*.

A few seen between May 22 and 25. Very abundant in the autumn, occurring in large flocks in the long grass of the old marshes and on the lake shore. In 1918, Young found large flocks on April 24, but the bulk of the species left after the 30th. One straggler was taken on June 4. In the autumn the flocks of the previous year were absent and he noted but one individual on Sept. 23.

142. *CHESTNUT-COLLARED LONGSPUR, *Calcarius ornatus*.

A single bird secured on June 6, 1917, and a flock of seven noted on the 9th. It was not seen by Young in 1918. Seton has a specimen taken by Miller Christy in May, 1887, but the Ward brothers are not familiar with it, and it is doubtless rather rare in the locality or very local in distribution.

143. *VESPER SPARROW, *Poocaelus gramineus*.

Strangely absent both springs in the vicinity of the lake though from the train one was seen a few miles south of Erinview. In the autumn of both years they were seen about the Ward house in limited numbers between Aug. 23 and Sept. 28. These birds are rather large for the eastern race, and though in rather indeterminate juvenile plumage can probably be referred to the western race *P. g. confinis*.

144. *SAVANNA SPARROW, *Passerculus sandwichensis*.

Very common indeed during all visits. The local breeding birds show the bright yellow eye-brow common to the birds of the prairie provinces, and certainly do not agree with the described characters of *P. s. alaudinus* and at present seem without a name. The autumn birds are slightly darker than savanna and are both with and without the yellow loreal spot. I suspect that both a resident and a migrant form are represented, but I do not care to refer them to any sub-species generally accepted at present.

145. BAIRD'S SPARROW, *Ammodramus bairdii*.

Though reported by Chapman as very common at Shoal Lake and by Seton as common and breeding, the species was carefully searched for both seasons without success. Undoubtedly it has departed from the country with the lowering of the lake level and the disappearance of the broad marshes.

146. *LECONTE'S SPARROW, *Passerberbulus lecontei*.

Scattered individuals were met with both seasons in widely separated localities both in spring and in autumn.

147. *NELSON'S SPARROW, *Passerberbulus nelsoni*.

The western form, the Prairie Sharp-tailed Sparrow, *P. n. nelsoni* was met with in scattered individuals in various parts of the surrounding country as late as September 25. The juvenile plumage is quite different from that of the adult and might well be taken for a different species. All strong ochre, slightly paler below and only broken by restricted fuscous centres of secondaries and wing coverts which become fainter and almost concealed across the back, a double crown stripe and a faint bar back from the eye. The outer web of the first primary is edged with clear cream and the tail is ochraceous-fuscous with dark shaft. One specimen shows adult plumage appearing in the juvenile dress indicating that full plumage is assumed the first winter.

148. *HARRIS'S SPARROW, *Zonotrichia querula*.

Very common on our first arrival in 1917. Most of them left about May 28, though a couple of individuals remained to the end of our stay. Frank Ward reported seeing one carrying nesting material from his chip-yard towards the nearby bluff and suspected that they were nesting in the locality. The same authority tells us that some years ago he found a nest of this species on the ground in the shelter of an old log. On the return visit the same autumn they were common again in their old spring haunts and I was informed that individuals had been noted regularly through the summer. With this possibility of finding breeding birds, Young watched carefully for them during the summer of 1918, but between May 28 and Sept. 14 none were noted. They returned on Sept. 14 and were still present when he left on Oct. 2. The most peculiar thing about these autumn birds was the unusual abundance of adults in comparison to juveniles. Of perhaps fifty birds seen but three or four were juvenile either by plumage or cranial characters. This is unusual enough amongst autumn birds to justify special mention, as usually juveniles greatly outnumber adults.

149. *WHITE-CROWNED SPARROW, *Zonotrichia leucophrys*.

In 1917, single individuals seen on May 15 but

common throughout the autumn stay. In 1918, present in limited numbers from May 6 to May 23 and rather more numerous Sept. 17 to 30. Of those in adult plumage, two males (May 13, 1918 and Sept. 20, 1917) have the white loreal line continuous to bill and can therefore be ascribed to *Z. l. gambeli*. The other has it faintly interrupted across the lores and must therefore be regarded as intermediate between *Z. l. leucophrys* and *gambeli*.

150. WHITE-THROATED SPARROW, *Zonotrichia albicollis*.

Common both spring and autumn. In 1918, absent from May 27 to Sept. 8, except four individuals seen on July 24. Great numbers seen Sept. 19-27, but still present when Young departed on Oct. 2.

151. *TREE SPARROW, *Spizella monticola*.

Not noted in 1917. In 1918 observed from April 26 to May 4, and again on Oct. 1 and 2. One specimen, female, April 30, I refer to *S. m. monticola*.

152. *CHIPPING SPARROW, *Spizella passerina*.

Very common in the spring of 1917. To the end of May flocks of a hundred or more were met. In the autumn the species was not certainly identified though the first day of arrival I thought I recognized them amongst the hordes of clay-colored sparrows. In 1918, Young noted a few on May 4 and 8. From the 16th to 27th it was present in flocks of from 50 to 100. The species departed on June 8 and no more were seen except 3 on July 23.

153. *CLAY-COLORED SPARROW, *Spizella pallida*.

Very common in spring and autumn. In 1917, they seemed to leave on Sept. 21, but in 1918, Young noted them to the date of leaving on Oct. 2.

154. *SLATE-COLORED JUNCO, *Junco hyemalis*.

In 1917, but one specimen seen in the spring but fairly common in the autumn. In 1918, Young noted it from April 24 to May 15 and from Sept. 6 to Oct. 2.

155. *SONG SPARROW, *Melospiza melodia*.

Common in spring and autumn of both years. In 1918, present on arrival, April 24, and when leaving, Oct. 2. Specimens taken between May 13 and July 31, probably breeding birds are the slightly lighter form, with more distinct markings, than eastern *M. m. melodia* and I refer them to *M. m. juddi*.

156. *LINCOLN'S SPARROW, *Melospiza lincolni*.

In 1917, single individuals seen and taken on May 19 and June 1. In the autumn seen nearly daily in limited numbers. Noted in limited numbers by Young in 1918 from May 11 to 25 and more commonly from Aug 3 to Oct. 1.

157. *SWAMP SPARROW, *Melospiza georgiana*.

Seen in small numbers in the spring of 1917 and more commonly in the autumn. In 1918, Young noted it from May 4 to 30 and again Aug. 21 to Oct. 2. Strangely enough but one bird was seen in the summer, June 10, which seems to indicate that the species does not breed in the locality.

158. *FOX SPARROW, *Passerella iliaca*.

One specimen taken Sept. 22 is all that was seen in 1917. In 1918, Young noted single individuals on Sept. 16, 24 and 30, and a flock of 30 on the 25th.

159. *TOWHEE, *Pipilo erythrophthalmus*.

In 1917, fairly common in the spring and still present Sept. 19 and 21. In 1918, Young saw a few individuals with general regularity from May 24 to July 29. A single bird, Aug. 13, and another Sept. 19.

160. *ROSE-BREASTED GROSBEEK, *Zamelodia ludoviciana*.

Fairly common during the spring visit in 1917. In 1918 observed irregularly from May 16 to Aug. 5.

161. *PURPLE MARTIN, *Progne subis*.

A few seen daily in 1917, probably the same ones. A few occupied a box near an adjoining summer cottage and another colony was found nesting according to aboriginal habit in a hollow tree a few miles from camp. In 1918, noted by Young from May 17 to Sept. 20.

162. *CLIFF SWALLOW, *Petrochelidon lunifrons*.

In 1917 a few seen daily with the flocks of Barn Swallows about camp and occasional birds elsewhere. Seton noted twenty-five nests on a barn in 1891. In 1918, noted from May 24 to Sept. 17.

163. *BARN SWALLOW, *Hirundo erythrogaster*.

Small colonies occupy most of the farm building groups in the neighborhood. In the autumn of 1917 this was the only swallow seen. In the chilly mornings a small flock of them would be found warming themselves on the sunny roof of the house where the frost was melting. As soon as the day warmed they disappeared over the meadows and rarely returned until the next morning. The last seen were on Sept. 21. In 1918, they remained common until Sept. 20.

164. *TREE SWALLOW, *Iridoprocne bicolor*.

In 1917, only a few seen each day in spring and none in the autumn. In 1918, they remained common until Aug. 21, but a few were seen thereafter until Sept. 17.

165. *BANK SWALLOW, *Riparia riparia*.

A few observed daily in the spring of 1917. The Ward brothers say that one stage of the lake left numerous steep banks five to six feet high and that swallows nested in these in great numbers. Now

these banks are far removed from the water, cut down by cattle and sheep, and are deserted by the birds. We saw no nesting places in the vicinity. Young noted it in 1918 only in autumn, arriving on Aug. 17, and seen in small numbers irregularly until Sept. 12.

166. *CEDAR WAXWING, *Bombycilla cedrorum*.

In 1917, a flock of a hundred or so seen on May 11 and smaller lots daily thereafter through the spring visit but not noted in the autumn. In 1918, the species was first seen on June 4th and irregularly observed until Sept. 26.

167. *LOGGERHEAD SHRIKE, *Lanius ludovicianus*.

In the spring of 1917 we found two breeding pairs and a single individual. I can find little foundation for Ridgeway's color distinction, "decidedly paler" of the White-rumped Shrike, *L. l. exubitorides*. Prairie birds are very slightly paler than *L. m. migrans* from eastern Ontario. The difference can only be observed by the closest comparison. In the four specimens taken at Shoal Lake the rumps are intermediate between that of eastern birds and *exubitorides* from Alberta. I, therefore, regard them as intermediates between these rather poorly defined races.

168. *RED-EYED VIREO, *Vireosylva olivacea*.

In 1917, not seen until May 30 after which occasional birds were noted. Not seen that autumn. In 1918, Young noted the species continuously, in fair numbers from May 17 to Sept. 16.

169. *PHILADELPHIA VIREO, *Vireosylva philadelphia*.

Not noted by us in 1917, but Seton has a specimen in his collection taken at Shoal Lake by Miller Christy on May 20, 1887; Young collected specimens on the following dates in 1918, May 21 and 24, June 1 and Sept. 24.

170. *WARBLING VIREO, *Vireosylva gilva*.

In 1917, quite common after May 28. In 1918, Young found it constantly present in fair numbers from May 20 to Sept. 26. All specimens are *V. g. gilva*.

171. *SOLITARY VIREO, *Lanivireo solitarius*.

Not noted by us in 1917, but seen by Young in 1918 from May 10 to 20 and Sept. 2 to 16.

172. *BLACK AND WHITE WARBLER, *Minotilta varia*.

In 1917, occasional individuals seen after May 30 in spring and one on Sept. 19. In 1918, Young noted it with fair regularity, but scarcer in July, from May 8 to Sept. 26. It probably breeds.

173. *NASHVILLE WARBLER, *Vermivora rubricapilla*.

Not noted in 1917 but reported by Young in 1918 to be very common in May and September. Noted May 18 to June 20 and Sept. 2 to 26 with occasional individuals through July.

174. *ORANGE-CROWNED WARBLER, *Vermivora celata*.

In 1917, seen the first two days of our spring visit and on Sept. 19. In 1918, Young noted it only from May 17 to 24. In specimens obtained the yellow is slightly lighter than in comparable eastern species, but as this is probably due to the cleaner and better condition and make up of the skins, I regard them as *V. c. celata*, the geographical probability.

175. *TENNESSEE WARBLER, *Vermivora peregrina*.

Not noted in 1917, but reported by Young in 1918 to be very common in May and September. Noted May 18 to June 24 and Sept. 2 to 26 with occasional individuals through July.

176. *CAPE MAY WARBLER, *Dendroica tigrina*.

Two taken at Maple Island on May 30, 1917, and noted by Young on May 21 to 24, 1918.

177. *YELLOW WARBLER, *Dendroica aestiva*.

In 1917, a few present on our arrival on May 17 but common after June 1. In 1918, common from May 8 to Sept. 16. Compared with the writer's experience with this species in southern Ontario this is a very late stay for the species as in the Lake Erie neighborhood Yellow Warblers are rarely seen after Sept. 1.

178. *MYRTLE WARBLER, *Dendroica coronata*.

In 1917, the commonest Warbler on both visits. In spring it disappeared about June 1, after which but occasional individuals were seen.

179. *MAGNOLIA WARBLER, *Dendroica magnolia*.

In 1917, rather scarce in spring. In 1918, on the contrary, Young found it quite common from May 16 to the 27th and in the late autumn from Sept. 2 to 28.

180. *CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica*.

Individuals seen June 4 and 5 and on Sept. 17. Not seen by Young in 1918.

181. *BAY-BREASTED WARBLER, *Dendroica castanea*.

In 1917, only seen on June 2 and 6. In 1918, only noted on Sept. 6 to 12.

182. *BLACK-POLLED WARBLER, *Dendroica striata*.

In 1917, first seen on May 30. Quite common on June 2, and but occasional individuals thereafter. One seen on Sept. 17.

183. *BLACKBURNIAN WARBLER, *Dendroica fusca*.

One taken by Young on May 16, 1918, is our only record.

184. *BLACK-THROATED GREEN WARBLER, *Dendroica virens*.

Individuals seen by Young on May 24 and Sept. 4, a specimen being taken on the latter date. He also reports the remains of another impaled by shrikes without giving date.

185. *PALM WARBLER, *Dendroica palmarum*.

In 1917, present in limited numbers on our arrival but none seen after May 25. Several seen between Sept. 19 and 22. In 1918, noted by Young from May 8 to 30 and Sept. 6 to Oct. 2, the date of departure.

186. *OVENBIRD, *Sciurus aurocapillus*.

In 1917, a few single individuals were heard and seen in the deeper woods from May 29 on. Before leaving they become slightly more common. In 1918, noted by Young from May 21 to June 3, one individual in July, and then again from Sept. 2 to 14. This is a retiring species and oftener recognized by ear than sight. Its absence through June, July and August is probably more apparent than real.

187. *NORTHERN WATER THRUSH, *Sciurus noveboracensis*.

In 1917, two water thrushes were seen, perhaps an original pair, May 18 and June 2, in the dry willow grown creek bed by the Ward house. On Sept. 19 another was noted in the same locality. In 1918, the species was noted with daily regularity from May 10 to 25 and Sept. 4 to 26, with a single individual on Aug. 22. The specimens are in a very mixed lot of plumages, and one a male, Sept. 12, is nearly as white below as a Louisiana Water Thrush, *S. motacilla*; two other specimens are nearer the eastern one *S. n. noveboracensis* than *S. n. notabilis*. Three others while yellower below and blacker above and characteristic *notabilis* are quite comparable with some New Brunswick birds. I find that Grinnell's Water Thrush rests upon very inconstant characters.

188. *CONNECTICUT WARBLER, *Oporornis agilis*.

On June 4, 1917, one bird was seen under excellent conditions for determination, when shot it fell far away in heavy brush and could not be found. One juvenile was taken by Young on Sept. 16.

189. *MOURNING WARBLER, *Oporornis philadelphia*.

Several times in the spring of 1917 I thought I heard this bird in a slashing in the oak patch in the big bluff behind the camp. It kept so close to a limited locality that I have no doubt that it was nesting nearby. It was absolutely identified June 14 when secured. In 1918, the species was noted by Young from May 30 to June 8 and one was taken Sept. 7. Specimens of this species in fall plumage are rather scarce in collections as it usually drifts through very inconspicuously early in the autumn.

190. *MARYLAND YELLOWTHROAT, *Geothlypis trichas*.

Quite common after June 2. In the autumn individuals were seen Sept. 21 and 22. The species obtained are referable to *G. t. occidentalis*, the

Western Yellow Throat. The backs are faintly lighter than eastern and intermediate between them and individuals from Indian Head and Edmonton, but the white foreheads are decidedly more extensive than in eastern species.

191. *WILSON'S WARBLER, *Wilsonia pusilla*.

Only seen in 1918 on May 18. In 1918, Young observed the species on May 16, 18 and 24.

192. *CANADIAN WARBLER, *Wilsonia canadensis*.

One taken on June 6, 1917, and noted by Young on May 24 and June 4.

193. *REDSTART, *Setophaga ruticilla*.

Not seen in 1917 until May 29, but common thereafter. In 1918, Young observed it from May 18 to June 8 and from Aug. 26 to Sept. 27. He did not note it through the summer.

194. *AMERICAN PIPIT, *Anthus rubescens*.

In 1918 fairly common during the early days of our spring visit along the lake shore, but none seen after May 30. Abundant in the fall occurring in large flocks, scattered bunches and individuals on all bare ground. In 1918, noted by Young on May 13 and 27 and Sept. 14 to date of departure Oct. 2.

195. *SPRAGUE'S PIPIT, *Anthus spraguei*.

Between June 5 and 9, 1917, I was much puzzled by an oft repeated and haunting bird song that could be barely heard and which I was unable to locate or recognize. It was a fine silvery gradually descending Ree-ree-ree-a-ree-a-ree-a-ree-aree of about eight notes, and an octave in range. It had a peculiar ringing jingle like the Veery but more sustained and regular. After innumerable futile attempts at discovering the singer at last I found it high over head flying about in circles for minutes at a time. It beat its wings vigorously against the slight breeze, making altitude rather than headway, and then the song came down. After the first two or three syllables reached the ground the wings fixed and the bird would sail in a downward spiral through the remainder of the song. This was repeated time and time again. It took considerable patience to watch the little vocalist until it came down to earth by an almost straight dive. Though nearly out of sight in the air the speed with which it dropped and the distance away at which it alighted indicated that it was originally up no more than a hundred yards or so while singing. Thereafter we could hear this song nearly the whole of every fine day, but this was the only bird of the species that we met. In 1918, Young reports the species occasionally throughout the summer from June 21 to Sept. 7.

196. *CATBIRD, *Dumetella carolinensis*.

Common, found in nearly every bluff. In 1918, Young noted it almost daily from May 20 to Sept. 11.

197. *CROWN THRASHER, *Toxostoma rufum*.

Fairly common. At least two pairs lived within hearing of our camp in 1917 and we met with half a dozen more on our spring rambles. In 1918, Young noted it constantly from May 16 to Aug. 24 with a couple of late individuals on Sept. 12 and 17.

198. *HOUSE WREN, *Troglodytes aedon*.

Very abundant and heard singing everywhere. They do not seem as inclined to build about the farm buildings as the species does in the east. There were innumerable possible nesting places about the farmstead that few eastern wrens could resist yet none of them were occupied. A few individuals were still present during the autumn visit. In 1918, Young noted it continuously and regularly from May 10 to Sept. 30. Specimens are distinctly *T. a. parkmani*.

199. *WINTER WREN, *Nannus hiemalis hiemalis*.

Not seen in 1917, but in 1918 Young observed single individuals from May 20 to 23, and on Sept. 16.

200. *SHORT-BILLED MARSH WREN, *Cistothorus stellaris*.

Not uncommon in certain localities. While usually inhabiting damp marshes some were found in dry grass or even in brushy edges in typical House Wren ground. None were certainly recognized in the fall of 1917 though Young lists it occasionally from June 1 to Sept. 25.

201. *LONG-BILLED MARSH WREN, *Telmatodytes palustris*.

Hardly commoner than the Short-bill and not so widely distributed. This species requires wetter and more extensive swamps than that species and the drying up of the marshes would more severely limit its habitat. A Marsh Wren glimpsed on the shore of a small pond on Sept. 19, 1917, was supposed to be of this species. Owing to their more restricted habitat the Long-billed Marsh Wren was, in 1918, even scarcer than the previous year. Young only records occasional individuals May 7 and June 10. Specimens show the light back, and brown rather than black head of *T. p. iliaceus*.

202. *BROWN CREEPER, *Certhia familiaris*.

Young took two specimens of the Brown Creeper on Sept. 23 and 26, 1918.

203. *RED-BREASTED NUTHATCH, *Sitta canadensis*.

One individual seen by Young on Sept. 24, 1918.

204. *BLACK-CAPPED CHICKADEE, *Penthestes atricapillus*.

Only seen in 1917 on May 20 and Sept. 26. Of the former one female was taken with an egg in oviduct ready for deposition. Scattered individuals noted by Young throughout the summer of 1918. Specimens taken have constantly longer tails than

any but extreme eastern specimens and hence are referred to *P. a. septentrionalis*.

205. *RUBY-CROWNED KINGLET, *Regulus calendula*.

In 1917, single individuals seen May 20 and June 1. In September a few were seen nearly every day. In 1918, noted by Young daily from May 7 to 24 and Sept. 9 to 30.

206. *WILSON'S THRUSH, *Hylocichla fuscescens*.

Common. Its golden chain song could be heard every evening from our camp. In 1918, Young recorded it nearly every day from May 9 to Sept. 28. All specimens show the slightly olive back of the Willow Thrush, *H. f. salicicola*.

207. *ALICE'S THRUSH, *Hylocichla aliciae*.

Thrushes of this genus were fairly common during migrations, but the bush was generally so dense and the birds so shy that collection gave the only certain separation between Alice's and Olive-backed Thrushes. I was fairly certain that we had specimens of both in the spring collection of 1917, but they all were lost in transit. One specimen taken by Young on Sept. 19 belongs to this species.

208. *OLIVE-BACKED THRUSH, *Hylocichla ustulata*.

In 1918, Young noted thrushes under this heading from May 15 to June 1 and Sept. 6 to 20. All his specimens except one mentioned under previous heading are of this species which is probably the more common. We have specimens of the following dates: juvenile and adult males Sept. 18, 1917, Sept. 6 and 9, 1918; and juvenile females Sept. 9, 1918. These four are slightly but consistently more olivaceous (or grayer) above and rather more heavily spotted on breast than comparable eastern *H. u. swainsoni* differing from them almost as much as the Willow Thrush, *H. f. salicicola* differs from the Veery, *H. f. fuscescens*. I find these same distinctive characters in an autumn specimen from as far west as Jasper Park but not in spring and summer birds from intermediate points. These specimens agree closely with the description and range of *H. u. almae* Oberholser, and if every perceptible difference is regarded worthy of a separate name this form probably has claim to reinstatement in the Check List.

209. *HERMIT THRUSH, *Hylocichla guttata*.

Quite common during the spring of 1917. The last specifically recognized was on June 2. In the autumn one was taken on Sept. 19. In 1918, Young noted the Hermit Thrush from May 13 to 24 and Sept. 3 to 30. These are of course eastern Hermit Thrush, *H. g. pallasii*.

210. *AMERICAN ROBIN, *Planesticus migratorius*.

Common on all visits, in 1918, at date of departure, Oct. 2.

211. *BLUEBIRD, *Siala sialis*.

Though not known by the Ward brothers as a

bird of the locality, we took a pair in 1917 on May 28, and later some six individuals were seen at various times in the neighborhood. In 1918, Young saw 2 and 7 birds on June 24 and 25. On Oct. 2 as he was leaving there was a migrational wave of the species and he lists 50 for that day. This suggests that far from Shoal Lake being the most northern extremity of the species range here there is a habitat beyond that is occupied by them in considerable numbers. The species is apparently spreading into this country.

ADDENDA.

Since the publication of the earlier parts of this paper the following published data on the birds of the locality have been called to my attention in

Recent Bird Records for Manitoba by E. T. Seton, *Auk*, XXV, 1908, pp. 450-454.

20. (*antea*) BLACK DUCK, *Anas rubripes*.

Mr. Seton here reports another Shoal Lake specimen of this species in his collection taken by Geo. H. Meacham in 1901 who reports "two or more were shot at Shoal Lake in 1899".

28. (*antea*) WOOD DUCK, *Aix sponsa*.

Seton says: "G. H. Meacham reports it rare at Shoal Lake, but one or two are seen there each year".

212 LEAST BITTERN, *Ixobrychus exilis*.

Seton says: "Frank M. Chapman saw one at Shoal Lake, June, 1901".

BRIEF REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 18, 1919.

The fortieth year of the existence of The Ottawa Field-Naturalists' Club has been the most successful in the recent history of the society. The club activities are directed toward popularizing and diffusing knowledge of the natural sciences, and have been carried on in three chief ways: a course of lectures, two series of field excursions, and the publication of THE OTTAWA NATURALIST.

The club membership now numbers 540. Twenty-one members serving overseas have been carried gratis.

The lecture programme consisted of seven scheduled lectures and a special lecture on wild geese by Mr. "Jack" Miner, of Kingsville, Ontario. The lectures are planned to create a more intelligent interest in Canadian natural history, and to give a better understanding of the value of scientific work.

The field excursions were well patronized, especially the spring series at which the attendance averaged 38. Weather conditions reduced the attendance at the fall series. The spring series consisted of five outings and the autumn series of three outings. Scientific men attended the excursions to direct interest and answer questions.

THE OTTAWA NATURALIST, the official organ of the Club has been enlarged in dimensions and improved in material qualities and by the introduction of a cover design, more illustrations and more articles of Dominion-wide interest.

At the request of several natural history societies of the Dominion, a plan of affiliation has been arranged, the magazine of The Ottawa Field-Naturalists' Club to be the medium of publication.

The officers and committees for the year 1919 are as follows:

President, M. Y. Williams; Vice-Presidents, L. D. Burling, P. A. Taverner; Secretary, Clyde L. Patch; Treasurer, F. W. Waugh; Editor, Arthur Gibson.

Additional members of Council: Hoyes Lloyd; W. T. Macoun, G. A. Millar, R. M. Anderson, J. M. Macoun, Miss M. E. Cowan, Miss Crampe, C. B. Hutchings, C. M. Sternberg, H. I. Smith, H. McGillivray, H. B. Sifton.

STANDING COMMITTEES OF COUNCIL.

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Lectures—J. M. Macoun, P. A. Taverner, L. D. Burling, W. T. Macoun, G. A. Millar, R. M. Anderson.

Trust Funds—W. T. Macoun, C. Gordon Hewitt, H. M. Ami.

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LEADERS AT EXCURSIONS.

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Entomology—C. B. Hutchings, Arthur Gibson, Dr. C. G. Hewitt, J. M. Swaine, F. W. L. Sladen, Miss Crampe.

Geology—Dr. E. M. Kindle, Dr. W. Y. Williams, H. McGillivray, L. D. Burling, E. Poitevin, Dr. M. E. Wilson.

Ornithology—P. A. Taverner, C. L. Patch, Dr. M. Y. Williams, A. G. Kingston, Hoyes Lloyd.

Zoology—Dr. R. M. Anderson, A. Halkett, E. E. Lemieux, E. A. LeSueur, C. H. Young, C. E. Johnson.

Photography—W. S. Hutton.

NOTES AND OBSERVATIONS.

AMERICAN SOCIETY OF MAMMALOGISTS.—The organization meeting of the American Society of Mammalogists was held in the New National Museum, Washington, D.C., April 3 and 4, 1919, with a charter membership of over two hundred and fifty, of whom sixty were in attendance at the meeting. The following officers were elected:

President, C. Hart Merriam (Washington); First Vice-President, E. W. Nelson (Washington); Second Vice-President, Wilfrid H. Osgood (Chicago); Recording Secretary, H. H. Lane (Oklahoma); Corresponding Secretary, Hartley T. H. Jackson (Washington); Treasurer, Walter P. Taylor (Washington). The Councilors are: Glover M. Allen (Cambridge); R. M. Anderson (Ottawa, Canada); J. Grinnell (Berkeley); M. W. Lyon (Washington); W. D. Matthew (New York); John C. Merriam (Berkeley); Gerrit S. Miller, Jr. (Washington); T. S. Palmer (Washington); Edward A. Preble (Washington); Witmer Stone (Philadelphia); and N. Hollister (Washington), Editor.

Committees were appointed on: Life Histories of Mammals, Charles C. Adams, Chairman; Study of Game Mammals, Charles Sheldon, Chairman; Anatomy and Phylogeny, W. K. Gregory, Chairman; and Bibliography, T. S. Palmer, Chairman.

The policy of the Society will be to devote its attention to the study of mammals in a broad way, including life histories, habits, evolution, palaeontology, relations to plants and animals, anatomy and other phases. The Society arranged to start the publication this year of a "Journal of Mammalogy," in which popular as well as technical matter will be presented. This journal will fill a long felt want in the natural history world, for with all the publications dealing with bird life on this hemisphere, there has been none making a specialty of the no less interesting and important mammalian life.

In choosing the name of the Society, the word American is used in the broad sense of including all the Americas, North as well as South. Canada was represented at the organization meeting by two men, and several Canadians appear among the charter members. The Society starts out democratically, with but one class of members, the general consensus of opinion being that the establishment of fellows and different classes of members would not be conducive to the good feeling and harmony desirable in a society of scientific aims. The Society invites the co-operation and support of all persons in the study and conservation of the mammalian life of America.

REMARKS CONCERNING SAND LAUNCES.—There has recently been received for identification by the Fisheries Branch of the Department of the Naval Service a number of small specimens of Sand Lance (*Ammodytes personatus*) obtained from Barclay and Clayoquot Sounds, British Columbia.

The genus *Ammodytes* is represented on our coasts by three reported species in all, and all of which inhabit sandy shores.

The geographical ranges of the three are as follows:

A. personatus: Shores of the Pacific from California to Alaska, embracing British Columbia and the Aleutian Islands and westward to Japan. (This is the species of which the Department received specimens.)

A. americanus: Maritime Provinces, Gaspé Basin, Labrador and Newfoundland, southward to Cape Hatteras, North Carolina.

A. dubius: Labrador and Greenland, southward to Cape Cod. (As its name implies this is a doubtful species, and was first recorded by Reinhardt in 1838.)

Altogether there are about eight different species of sand launces, of which, besides our own, may be mentioned *A. lanceolatus* and *A. tobianus*, both of which occur on the British coasts.

ANDREW HALKETT.

THE MOUNTAIN BLUE BIRD, AND ITS IRREGULAR APPEARANCE.—Every observer of birds has noticed the abundance or scarcity of certain varieties in different years, and the reason of this periodical variation in appearance is often hard to account for. There are several birds that come under this class in Alberta, and perhaps the most prominent of these is the Blue Bird, (ours is the Mountain variety *Sialia currucoides*.)

The winter of 1917-18 was quite severe up till about the middle of March, when it turned very mild and spring like. On the 21st of the month I was very much surprised to see three Blue Birds flying along the telephone wires on one of the principal streets of Camrose. This was fully two weeks earlier than I had ever recorded them before in my twenty-eight years residence in Alberta.

A few days later the weather turned suddenly cold, and the month ended with below zero temperatures. The cold extended into Montana, between 200 and 300 miles south of this latitude. There is reason to believe that these three birds were not the only ones to come north around the 21st of the month, and it is likely that a large migration took place at that time. The cold weather

came on so unexpectedly that there can be little doubt but what all the Blue Birds that ventured so far north at that time must have perished.

The consequence was that there was practically an entire absence of these birds in this district the following summer.

F. L. FARLEY,
Camrose, Alberta.

ON THE EARLY LIFE-HISTORY OF THE AMERICAN LOBSTER (*Homarus americanus*).—Were this tiny creature, just after it has emerged from the egg, to be enlarged to say ten inches in length and a regular ten-inch long lobster put along side of it, two forms, quite unlike in general appearance would be seen. The reason for this difference in general form is because whilst the mature lobster crawls about upon the bed of the sea, the little juvenal does nothing of the kind, but swims, or rather floats upon its back, through the water or near the surface of the water. It would be interesting to follow out in detail how this most valuable of all crustaceans becomes more and more modified as it passes from moult to moult, but it must suffice for the present to point out that by the time the lobster has acquired the crawling mode of locomotion it has not then reached an inch in length. Obviously the free swimming mode of movement is primitive, and there are crustaceans, for

instance the phyllopods, which swim upon their backs throughout their life-histories, but in the case of the decapods, which stand higher in the scale of crustacean life, and to which shrimps, crabs, and the lobster belong, this phenomenon is usually only temporary, and in the case of the lobster is purely so. Now when the mother lobster, guided by her instincts, approaches the more shallow parts of the sea in order that her eggs may hatch off her swimmerets, and once the eggs are all hatched off, her maternal duties are over, for that is all the maternity she has. The young nauplii are now left to their own resources. It was a wise provision of nature that led the mother lobster to the shallows, for the little helpless creatures are there defended against many dangers which would have been encountered further out at sea. Furthermore, they undoubtedly meet there with a plenteous supply of surface food. Nor is this all. In the sheltered harbors and bays the little lobsters have an opportunity to undergo their metamorphosis until as little crawling creatures they seek refuge among the sea-weeds and under the rocks; from which time on they become better and better equipped, through increase in size, a shell hardened with carbonate of lime, and a pair of powerful claws, to protect themselves at considerable depths in more exposed parts of the bed of the sea.

ANDREW HALKETT.

BOOK NOTICES AND REVIEWS.

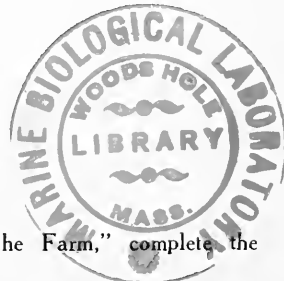
INJURIOUS INSECTS AND USEFUL BIRDS. By Prof. F. L. Washburn. J. B. Lippincott Company, Philadelphia and London; 414 illustrations in text and four coloured plates. Price \$2.00.

This volume prepared particularly for high schools and agricultural colleges is largely the result of 21 years of work in economic entomology on the part of the author. It will of course also be a useful work of reference for gardeners and farmers generally. Chapters one to six deal with the losses to agriculture due to insects and rodents; farm practices to lessen these; external structure of insects; collecting and preserving insects; insecticides, spraying and fumigation. Chapters seven to eighteen discuss insect affecting various crops, such as apple, pear, small fruits, grain, roots, etc. Chapter XIX on "Our Insect Friends"; XX, "The Relation of Birds to Agriculture" and XXI, "Some

Four-Footed Pests of the Farm," complete the volume.—A. G.

OUTLINES OF ECONOMIC ZOOLOGY. By Albert M. Reese, Ph.D., Professor of Zoology in West Virginia University. Philadelphia, P. Blakeston's Son & Co. 316 pages. 194 illustrations.

This volume which has been based upon a brief course in economic zoology given by the author for several years in the above university, will be found of special value to students, not only those who are taking courses in general zoology, but also those who are interested in agriculture. The book is divided into fourteen chapters, as follows: I, Protozoa; II, Porifera; III, Coelenterata; IV, Echinodermata; V, Platyhelminthes; VI, Nematelminthes; VII, Annulata; VIII, Mollusca; IX, Arthropoda; X to XIV, Chordata. The importance of the study of economic zoology is becoming more apparent every day.—A.G.





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CANADIAN ABORIGINAL CANOES.

By F. W. WAUGH, GEOLOGICAL SURVEY, OTTAWA.

Canoeing, it may be remarked by way of introduction, is one of a number of things which have been borrowed, either for use or amusement, from the American Indian. The name, strangely enough, has been introduced from a region at some distance from that with which we are accustomed to connect canoe culture in its typical form, being derived from the word "canoa," in use among the Arawak of the West Indies. This was adopted in a similar form by the Spaniards, and as "canot" by the early French in Canada. The fact that there was already a name in current use, then, is no doubt the reason none of the names applied by the Indians of the Eastern Woodland area of America was adopted.

An Ojibwa term, fairly well-known from its employment by Longfellow in "The Song of Hiawatha", is "cheemaun". A name applied to a very large craft is "nabikwan". A Mohawk appellation is "gahonwe'ia"; rendered by the Onondaga, a related tribe, as "gaho'nwa". It is interesting to note, in the last-mentioned dialects, the close resemblance to the term for a bark bowl or trough.

Quaint early English forms, now obsolete, are "canow" and "cannoe".

There is little doubt that, in the earlier days of French exploration and settlement along the St. Lawrence and of English settlement in New England, the birch-bark canoe of Indian make was very soon adopted as the most convenient method of travel. We can readily infer, also, from early writers and other such sources, the extremely important part played by the canoe in the development of a very large portion of the North American continent.

It would obviously be most interesting to trace the canoe and other such devices to their origins, but there are indications that the problem in hand is one of the diffusion or spread of a cultural trait already elaborated, or partly elaborated, it may be in some other region. This is in part suggested by both the extent and the continuity of the area in which canoes are used. We can see that migrations of population, or the influence of one tribe

upon a neighboring one (accultural influence) would soon disseminate the canoe idea, possibly in a simple form, very widely, and that, under the influence of the varied materials at hand and diversified requirements, specialization in various directions would later arise.

Materials naturally played an important part. In areas where trees were not at hand, or were less convenient, such materials as rushes were sometimes built into a boat-shaped raft (see the balsa of California); or a skin-covered craft was employed, as in the Eskimo area, among the neighboring Kutchin of the Yukon, the Tahltan and other Athabascans of the Mackenzie region, and in some parts of the Plains) see the "bull-boat," a tub-shaped craft of skin and withes, used by various Siouan tribes, including the Mandan and the Hidatsa; also by the Arikara, a Caddoan tribe). The Omaha (Siouan) used hide-covered boats or canoes of ordinary type, but with a rude framework, indicating the slight development among them of ideas regarding navigation. In the last-mentioned craft, an oar or large paddle was used for steering, the paddlers sitting near the bow.

One of the most interesting developments in North American navigation was the canoe of birch-bark, which apparently reached its perfection in the Algonkian area, a region extending from around the Great Lakes, and some distance westward, to the maritime provinces and the New England states, though the birch canoe area exhibits cultural extensions in various directions, but particularly northward and westward to the Mackenzie river basin. There is little doubt that this distribution was largely determined by the range of the canoe birch (*Betula papyrifera*), which extends practically from the Atlantic coast to the Rockies, as well as to some distance south of the international boundary. The disappearance of the birch southward is indicated by the fact that very inferior canoes of elm, buttonwood and basswood bark were constructed by the Iroquois of Central New York state and southward, who evidently found the materials last mentioned

more plentiful. The Iroquois canoe is everywhere stated to have been heavy and loggy, inconvenient for portaging and short-lived generally. In fact, so poor a craft it was in comparison with that of the Algonkians, that the Iroquois are said to have traded eagerly for the lighter and more substantial contrivance.¹

Bark and skin-covered canoes, however, are not the only craft which have been used by Canadian Indians, since at least two other devices—usually constructed in a very primitive style—are found side by side with considerable advancement in navigation. The dugout, for instance, which is usually little more than a hollowed-out log, is employed by a great many tribes along with canoes of a much superior kind. Another very primitive-appearing contrivance, the raft, is distributed quite widely, though employed to a greater extent in some areas than in others.

It may be unnecessary, or even impossible, for us to decide which of the foregoing came into use first, but we should certainly be quite near the mark in placing the raft first in degree of simplicity, with the simpler class of dugout next.

THE BIRCH-BARK CANOE.

Practically everywhere within the region of Algonkian influence proper the birch-bark canoe was essentially the same, such differences as occur concerning mostly the shape of bow and stern, which has evidently been derived almost exclusively from a single pattern, with local variations in the amount of curvature or recurvature and the method of decking over at the ends, where such a device was employed. The Malecite (western New Brunswick) and Ojibwa forms are very good examples of the extremes in outline in the Algonkian region. The Malecite canoe also exhibits the decking-over sheet at the ends, with side-flaps, in a well-developed form. As we proceed westward, this sheet decreases in size in the Algonquin canoe of northern Quebec and Ontario and becomes vestigial in a smaller form used by certain of the neighboring Ojibwa. The same purpose, that of preventing the inflow of water, is accomplished by the recurving ends of the Ojibwa type with which we are most familiar.

Regarding the Algonkian tribes of central Labrador, Turner remarks that "a tribe of great dissimilarity between the Naskopies and the Little Whale River Indians (Eastern Cree) is that the

birch-bark canoe of the latter is much more turned up at each end, producing a craft well adapted to the swift currents of rivers." He also states that "the occupants are skilful boatmen," that "sails are sometimes erected in a single canoe," and that "at times two canoes are lashed together and a sail spread from a single mast."²

An offshoot of the Algonkian canoe was the "rabiscaw" of the Hudson Bay Company, an extra large birch-bark craft designed to meet the demands of the fur-trade. A prominent feature was the high, upturned bow and stern decorated with gaudy designs.

At the western extremity of the bark canoe area we find at least two somewhat divergent forms which suggest an attenuation of eastern accultural influence, combined, possibly, with modifications from other sources. The Dog-ribs, an Athabascan tribe of the Mackenzie basin, like the Ojibwa, construct a birch-bark canoe having separate keel-pieces for the bow and stern. The small and narrow ribs and the slender, widely-separated siding or flooring strips extending from end to end, however, show some resemblance to kayak construction. A special feature (also showing a resemblance to the kayak)³ is the fairly extensive sheet of decking at either end. Conspicuous side-flaps, of the type found in the Algonquin decking, are lacking. The seams are sewn with spruce root and gummed.

Among the Kootenay and the various Salish tribes of southern British Columbia is found a canoe of pine or spruce bark, rather rude in general workmanship and showing but little external resemblance to eastern forms. The most striking feature is the peculiar pointed extension of the lower part of bow and stern, which is said to be specially adapted to rapid rivers. From a structural point of view no radical difference from eastern types is to be noted. The bark of the yellow cedar (*Thuja excelsa*) is also mentioned as a British Columbia canoe-making material.

A Slave canoe from the neighborhood of Hay river (flowing into Great Slave Lake) exhibits an upward extension at the bow and stern which adds much to its picturesqueness. In other respects it conforms closely to eastern models.

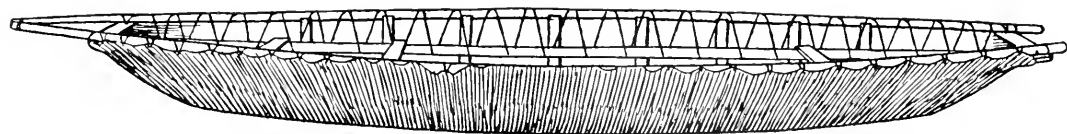
A description of Ojibwa canoe-making will no doubt give a fair idea of the methods employed throughout most of the bark canoe area.⁴ The process is most interesting and requires considerable skill.

¹Dr. E. Sapir, in "Time Perspective in Aboriginal American Culture," Memoir 90, of the Geological Survey (Canada), p. 20, remarks: "Similarly, the clumsy elm-bark canoe of the Iroquois seems less adapted to its cultural environment than the various types of birch-bark canoe of their Algonkian neighbors. We may risk the guess that the Iroquois bark canoe is an imperfect copy in elm-bark, a characteristically Iroquois material, of the superior Algonkian types, and connect this further with the general consideration that the Iroquois were rather more inclined to be cross-country walkers than the neighboring Algonkian tribes, who were more adept river and sea folk."

²Turner, Lucien M., "Ethnology of the Ungava District," 11th Annual Rept. of the Bureau of Ethn., Washington, D.C., p. 182.

³Mention of this resemblance is made by Pettit, in "Autour du Grand Lac des Esclaves," p. 268.

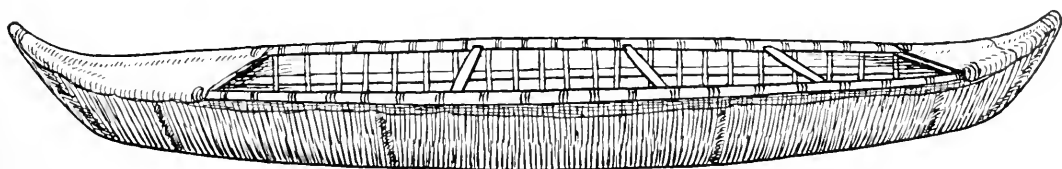
⁴From data obtained by the writer among the Saulteaux, or Ojibwa of the Lake Nipigon region. Permission to use this and other original notes was accorded by the Geological Survey, Ottawa, Canada.



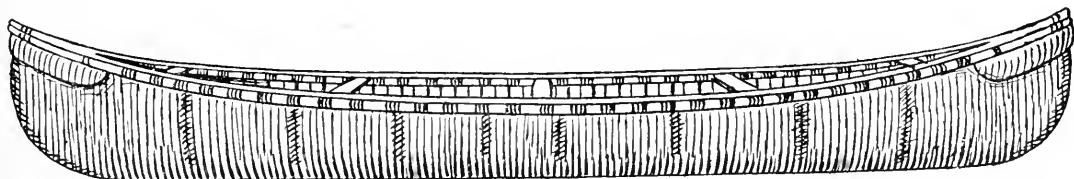
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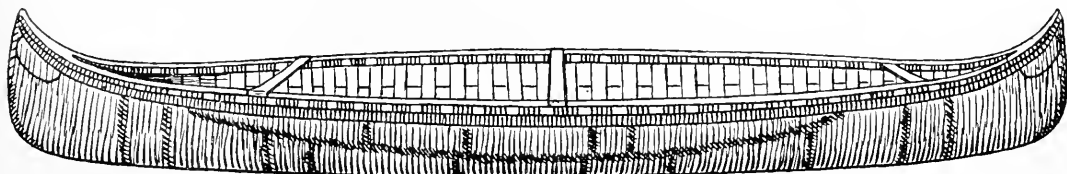
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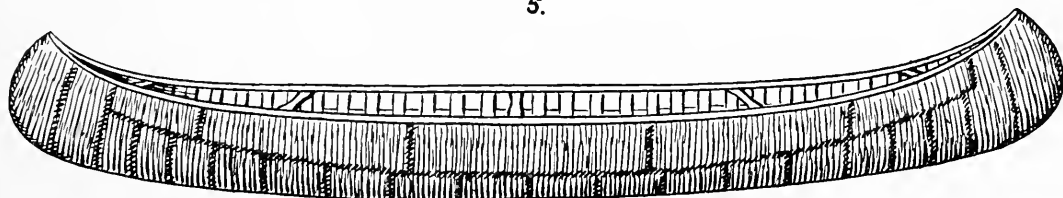
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CANADIAN CANOES.

1, Alaskan Eskimo umiak, or open boat; 2, Labrador Eskimo kayak; 3, Dog-rib canoe; 4, Malecite canoe; 5, Algonquin canoe; 6, Montagnais canoe.

Thin strips of cedar (*Thuja occidentalis*) for the ribs, and the sheeting used between the ribs and bark to prevent injury to the latter, are obtained, split into approximate sizes and placed in water to render them more flexible. Another important requisite is the birch-bark, which peels off most easily late in June or early in July. This is rolled up and laid away in the shade. Towards evening, or at any time, if the day is cloudy, stakes (nine or more to a side) are driven into the ground at intervals to approximate the length and width of the canoe. These are made to flare outward slightly. The bottom pieces of bark are now placed in position, overlapping a few inches in the middle where they are to be joined. A single length of bark is preferred for the bottom. This, however, is not always obtainable, so that two pieces, or even three, may be used. Stones are laid on the bark to hold it down, and a bottom frame, approximating the width of the canoe at the bottom and pointed at both ends, is applied. The work so far is done by the men. The next operation, that of shaping the bottom by making slashes or gores on each side and sewing these with spruce root, is done by the women. The gores are made towards the ends, where the canoe begins to narrow. The upper edges of the bark are also trimmed evenly. The spruce root for sewing has been split by the women to a suitable size and rendered flexible by steeping in fish broth. The men next lay the upper lengths of bark alongside, measure them by trial, then place them in position. The bottom pieces are now scored along the bottom with an axe where they are to be creased for the taper to bow and stern, after which both upper and lower barks are pinched together by stakes driven closely and tied at the top. An inner frame (or "inside gunwale") giving shape to the upper edge of the canoe, and having exactly the right taper and curve, has been prepared beforehand and is now placed between the upper barks and sewn closely and firmly to them. Pieces of cedar, bent to the approved shape of bow and stern, are placed between the barks at the ends of the canoe, the bark trimmed to conform to these in outline, then sewn to them with spruce root. The sewing, as before, is performed by the women, to whom this part of the work is always assigned. Stitches of uneven length are often employed, particularly around the ends, to prevent the bark from splitting.⁵ The gores and laps have in each case been well cemented or stuck together with clear gum boiled a little to thicken it.

⁵Other devices for preventing the edges from splitting along seams, are: The sewing of an extra strip of bark around the outer edge of the canoe beneath the gunwale; also the inclusion under the stitches of a strand of spruce root (often used along longitudinal seams where barks are joined). Both of these schemes are employed by the Dog-ribs, Slaves and Chipewyans.

The bottom frame, which is merely temporary, is now removed, the ribs taken from the water, bent to shape around the knee, cut to length and driven into place with a mallet. Other thin strips of cedar, three or four inches wide, are driven between the ribs and bark as the work proceeds. The purpose of these is to form a protective flooring and siding. The canoe, particularly at this stage, is kept well moistened both inside and out. The placing of the ribs and sheeting proceeds, generally speaking, from each end to the centre. Cross-pieces, to keep the top spread, are hammered in at every second rib. The ribs are a couple of inches wide and about the same width apart. When the insertion of ribs and sheeting is completed, the canoe may require a general correction in shape, which is given by tying it between stakes and exposing it for a while to the sun.

The next process, also a woman's job, is to get ready, or rather, to have ready, the spruce gum and to gum the seams. All laps have their outer edges running backwards or towards the stern, so as not to obstruct the motion of the canoe. The spruce gum is obtained from trees which have been gashed the year before, is boiled a while to thicken it and mixed with powdered charcoal—some say, to make it look nice. The bottom seam is coated with clear gum and pegged, not sewn.

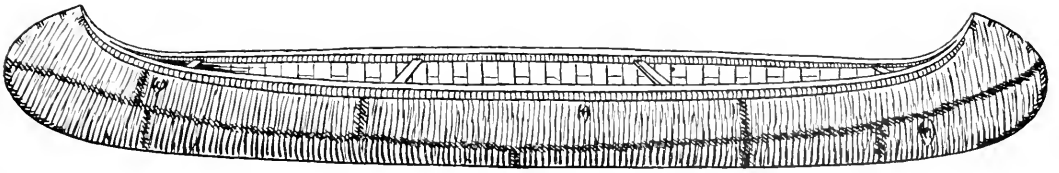
A little grease is said to be added to the gum by most tribes to render it more elastic. The addition of the powdered charcoal is not universal.

Among the Micmac of Nova Scotia and Cape Breton the women and girls are said to have prepared the gum by chewing it.

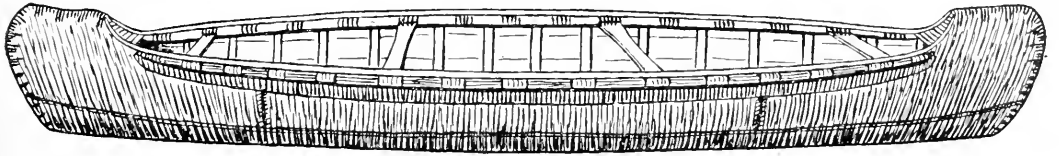
The last step in Saulteaux canoe-making is to attach a top gunwale strip. This is nailed on at present, but may have formerly been fastened on by tying or binding with spruce root.

The Malecite, according to information supplied by Mr. William McInnes, Director of the Geological Survey, Ottawa, construct temporary or emergency canoes of spruce bark which are used for bringing out furs from the hunting camps in the spring. The ribs and frame are roughly constructed of withes or saplings, flattened slightly and rather widely spaced, the bow and stern being chinked with clay.

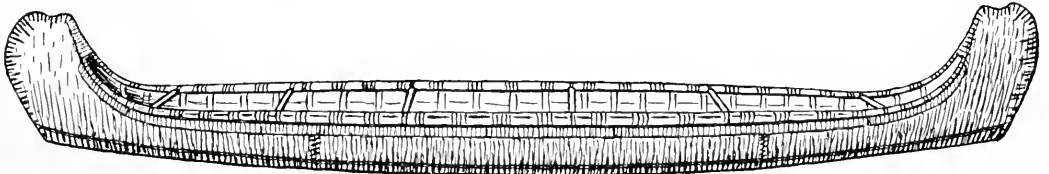
Mr. McInnes also furnishes an interesting description of the manner in which the Malecite protect the bottoms of birch-bark canoes in shallow streams: Lengths of spruce bark, with the smooth inner surface placed outward, are wrapped around the bottoms of the canoes from end to end and held in position by tying their edges to the thwarts with cedar inner bark. Another material, which is preferred to the spruce bark on account of its lightness, consists of strips of cedar about two inches wide and three-quarters of an inch thick. The strips run



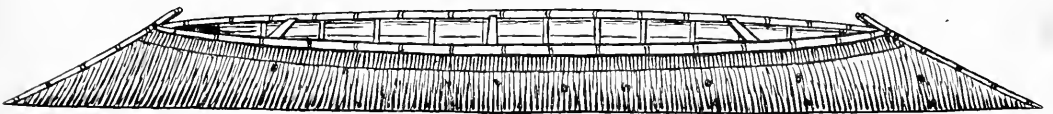
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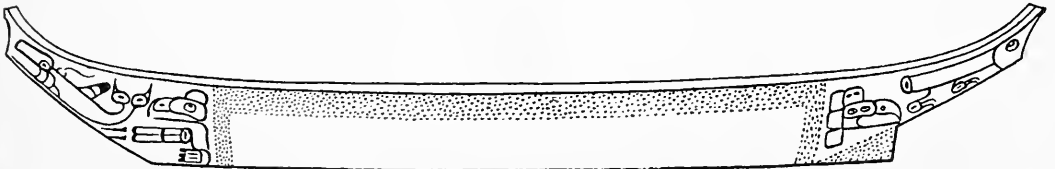
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CANADIAN CANOES.

1, Ojibwa canoe (Northern Ontario); 2, Chipewyan; 3, Slave; 4, Kootenay, Shuswap and other southern B.C., tribes; 5, Haida.

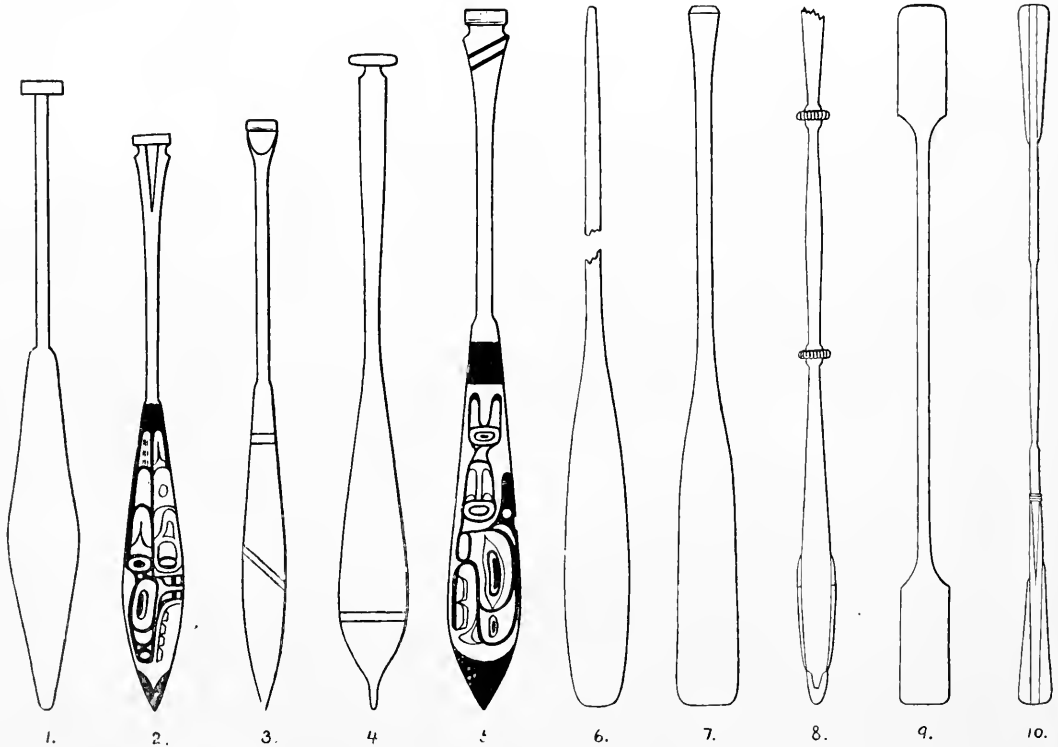
Nos. 3 to 6 on plate 1, and 1 to 3 on plate 2, are arranged consecutively to show how one form may have developed from the preceding.

lengthwise from end to end of the canoe, just high enough along the sides to afford protection from rocks, and are lashed together and to the thwarts by continuous strands of cedar bark which are threaded through perforations in their upper edges.

Micmac canoes in the Victoria Museum have the ends stuffed for a short distance with moss or shavings, the purpose being to keep the bark from collapsing or wrinkling where ribs are lacking. The stuffing is held in place by thin partitions of cedar, cut to shape and held in position at the bottom by the end of one of the inside sheeting strips. Slave and Chipewyan canoes also exhibit stuffing.

and navigation developed, with the exception that the Eskimo to some extent use large sea-going kayaks for hunting the whale and seal; and also that the Micmacs, like other coastal tribes, sometimes construct large bark canoes for a similar purpose. The sides of the Micmac canoe are up-curved and turned in towards the centre to exclude heavy seas.

The Eskimo kayak, for present purposes, may be regarded as a highly specialized canoe, differing from the Algonkian in the important, though not essential, respect of having the framework so constructed that it is held together independently of the cover; and in the superficial one that the covering



SOME TYPICAL PADDLES.

1 and 4, West Coast paddles, exact locality unknown; 2 and 3, Tlingit (northern B.C.); 5, probably Haida (Queen Charlotte Islands); 6, Kootenay (southern B.C.); 7, Ojibwa; 9, Copper Eskimo; 8 and 10, Central Eskimo. (The last three are neighboring groups).

In spite of its many excellent qualities and historic associations, the birch-bark canoe is evidently on the wane at present as a medium of travel. The factory-made canoe, though modelled after the Indian article, has, in fact, so far eclipsed it that it is seldom seen except among remote and backward bands of Indians who employ it mainly from economy or conservatism.

ESKIMO CANOES.

In only one region, the great insular area of the North Pacific Coast, was a true seafaring culture

of skin instead of bark, to which we may add that of being decked over so as to accommodate, in most cases, but one person.

The upper rim or frame of two pieces is made first, with mortises for the insertion of ribs and thwarts and holes for lashings. The thwarts are placed in position and the upper part or deck practically completed, one of the last steps being the attachment of a middle strip lengthwise along the top, except where it is intersected by the opening or man-hole. The whole affair is then turned top or face down-

wards. The ribs are now shaped and fitted and their ends inserted in the upper side-pieces and secured with wooden pins. The ribs are usually from two to six inches apart. The other longitudinal strips are then attached to the sides, with a similar piece along the middle of the bottom, which, like the other canoes described, is destitute of a keel.

The sealskin covering is sewn together and applied to the framework wet, so that it stretches tightly as it dries. The sewing, as in the case of the Algonkian canoe, is done by several women working together in order to complete the job at one sitting. A double waterproof stitching renders the seams water-tight.

of Yukon Territory and Alaska possesses features which give it an intermediate position between the umiak and the canoe of the region to the south and east. A canoe-like feature is the wedge-shaped bow and stern. A pointed or leaf-shaped paddle is used.

The umiak is said to have been entirely abandoned on the east coast of Labrador.⁷ In parts of the latter region and in Alaska it is used largely by the men for whale and walrus hunting as well as for general purposes. Lengthy journeys or migrations are often undertaken in it and its capacity is said to be remarkable.

The bow and stern of the Labrador umiak are



DISTRIBUTION MAP, the dotted portion showing the Eskimo kayak and umiak region, and the part covered by oblique lines, the birch-bark canoe region.

According to E. W. Hawkes, from whose memoir on the Labrador Eskimo the foregoing description is taken, "Great speed is maintained by the Eskimo in their frail kayaks. It is said that a single Eskimo in a kayak will propel it as fast as two white men will a canoe. The Eskimo ventures out in a sea that an Indian would not dare attempt. . . ."

The umiak, an open craft, also used by the Eskimo, presents a somewhat different appearance from the kayak due partly to its not being decked over and partly to its being rather deeper and clumsier in form. In other respects it does not differ materially, a fact which would suggest it as the form from which the kayak was derived.

An open skin-covered boat used by the Kutchin

wider than those of the Alaskan, which gives it a clumsier appearance. It is usually about twenty-five feet long and is steered with a rudder, quite likely an Asiatic borrowing, as are also the oars, rowlocks and sails. In Alaska the umiak is propelled by the more aboriginal paddle, the steering being done with an extra long and heavy one.

SAILS.

Sails were nowhere used as an integral feature of navigation except along the North Pacific Coast, where there is also a suspicion of Russian or other Asiatic influence.

The light and rather easily upset birch-bark canoe was evidently unsuited for propulsion by such a contrivance, except in very light breezes, or when

⁶Hawkes, E. W., "The Labrador Eskimo," Memoir 91, Geol. Survey, Ottawa, p. 72.

⁷Ibid., p. 68.

well loaded. That there was some appreciation of the assistance afforded by sails is likely, even though it failed to crystallize into a definite form. Catlin, for instance, states that among the Sioux a man would sometimes stand in a canoe facing the paddlers and hold a blanket spread out as a sail. The upper corners were held by the hands, while the lower part was tied to the body or to a thwart.⁸

Denys, a French explorer, speaking of the Micmac in 1651, remarks: "They also went with a sail, which was formerly of bark, but oftener of a well-dressed skin of a young moose. Had they a favorable wind they went as swiftly as the throw of a stone. One canoe carried as many as eight or ten persons."⁹

Skinner informs us, with regard to the Eastern Cree, that the "Canoes average twelve or fifteen feet in length, but those used by the Labrador

of Athabascans living on Portland Inlet, B.C., used sails of Marmot-skin.

These items, from various regions, suggest that the idea of sailing may have existed in an incipient form here and there, though none of them is perhaps perfectly free from a suspicion of European influence.

Brinton, the well-known anthropologist, states quite positively that no sails were used by the D  n  , or various Athabaskan tribes which occupy an immense region extending throughout northwestern Canada. In this he is supported by Morice, a missionary who spent many years with the D  n  .¹¹

PADDLES.

Paddles differ little in pattern throughout the greater part of the area in which we have followed canoe navigation, until we reach the extreme west, or the Eskimo country at the north.



SAULTEAUX CANOE-MAKING: Placing upper barks in position and trimming.

voyageurs are often twice that size and sometimes more. They are capable of bearing enormous weights, and many will hold twenty or more men. The paddles used are short and rather clumsy. They have no swelling at the end of the handle to facilitate the grip. In paddling, the Eastern Cree take shorter and more jerky strokes than their Ojibway neighbors of the south. When a fair wind is blowing, a blanket or even a bush is set up in the bow for a sail."¹⁰

According to Boas, the Tssetsaut, a small group

⁸Catlin, Geo., "Letters and Notes on the Manners, Customs and Conditions of the North American Indians," London, 1842, p. 214, and plate 294.

⁹Denys, Nicholas, "Description and Natural History of the Coasts of North America," The Champlain Society, Toronto, 1908, p. 422.

¹⁰Skinner, Alanson, "Notes on the Eastern Cree and Northern Saulteaux," Anthropological Papers of the American Mus. of Nat. Hist., vol. IX, part 1, p. 43.

Those used by the Ojibwa are extremely simple and are usually made of clear cedar. The paddler sits rather low, the toes turned inward and bent backward beneath the body. On a long journey a small pad of leaves or clothing is placed beneath the legs conveniently for sitting on.

A double-bladed paddle is used throughout most of the Canadian Eskimo region, although in Alaska the single paddle is found. Among the Aleuts of southwestern Alaska the paddle is pointed, like that of the Pacific Coast.

The Labrador double paddle is about ten or twelve feet long and made of hardwood or spruce tipped with bone. Leather rings on the handles keep the water from dripping on the paddler.

The British Columbia paddle and that used by

¹¹Morice, A. G., "The Great D  n   Race," *Anthropos*, vol. 5, p. 441.

certain adjoining tribes, such as the Aleuts and the western or northwestern Déné, is invariably sharply-pointed or lance-shaped and has almost invariably a T-shaped grip.

British Columbian influence in this respect seems observable eastward as far as the Slaves and the Chipewyans, who have the paddle obtusely-pointed.

WINTER TRANSPORTATION.

A conveyance of the type represented by the canoe, which is suitable mostly for summer, naturally supposes a corresponding winter contrivance, especially for the northern part of our range. That this was, or is, actually the case is suggested by the close correspondence of the dog and sledge or toboggan area with that of the canoe (Eskimo Athabaskan and Algonkian). The exceptions to this are found principally on the West Coast, where conditions are favorable to water transportation through-

Dugouts seem to have been used to a limited extent by the Ojibwa and by the Menominee, a tribe living in northern Michigan and Wisconsin, and fairly closely related to the Sauk, Fox and Kickapoo. This usage may also have been induced by a scarcity of the ordinary material, which is birch-bark.

The eastern dugout region seems fairly continuous southward from among the tribes mentioned, and would probably be contained very largely by the southern half of the Eastern Woodlands area, to which we might no doubt add the eastern half of the south-eastern area.

The canoe in common use on the lower Mississippi is a dugout, called "pirogue" by the French. The bow of this canoe is broad and sloping. The average measurement is forty feet by three in width, with a thickness of about three inches. A canoe



Saulteaux Indian inserting ribs.

out most of the year; on the Plains, where the travois replaced the sledge or toboggan, and canoeing was of relatively slight importance; and in the southern part of the Eastern Woodlands, where the snowfall is comparatively light.

THE DUGOUT.

The dugout, in most cases a rather crude canoe made by charring and hollowing-out a log, also has quite a wide distribution and is found, as already noted, in many regions where a more advanced type of canoe is also used.

Among the Iroquois, who were noted as independent canoe-makers, it was quite extensively employed, and is still used for the navigation of small streams for trapping and other such purposes. The scarcity of better materials may have been a factor in its popularity. The favorite Iroquois material is pine.

of this size will carry twelve persons. The material is usually some light or buoyant wood. A craft called by the same name is still to be found in the old "Acadian" region of eastern Canada. The material used is white pine. A black walnut dugout is used on the Arkansas. Besides a dugout, the Chitimacha of the lower Mississippi manufacture an elm-bark canoe.

Bushnell, in speaking of the Choctaw of Bayou Lacomb, Louisiana, states that "dugouts were employed on the creeks and bayous, but evidently only to a small extent." The Creoles at present make dugouts eight or twelve feet in length from logs of black gum.¹²

Those in use among the Creeks (a Muskogean tribe related to the Choctaw) were made of cypress

¹²Bushnell, D. I., jr., "The Choctaw of Bayou Lacomb, Louisiana," Bulletin 48, Bureau of American Ethnology, p. 18.

and are said to have had their ends slightly elevated and pointed.

Among the northern Ojibwa, Cree and Algonkian tribes generally, the dugout is conspicuous by its absence. The same remark holds good for the Plains tribes and for the Eskimo.

The Iroquois method of making a dugout is probably typical for the whole eastern region in which it is used.

A tree of suitable material and size was first cut down—in former times by burning, the fire being localized by applying some damp material above the point where the tree was to be burned through. The log was cut to length in the same way. The next step was to build a number of small fires at intervals on top of the log, then hack away the charred part with adzes. The fires were rebuilt and the work continued in this way until a suitable hollow was obtained. The ends were shaped in a similar way. The same method of hollowing-out dugouts and large wooden bowls is practised by the present-day Iroquois.

Among the Déné, the adoption of the dugout is considered by Morice to be of fairly recent origin, dugouts of balsam poplar having, in his opinion, replaced the original spruce-bark canoe. These dugouts are sometimes thirty feet in length by not more than three in the middle and are said to possess no elegance or design of beauty.

Along the Pacific Coast the dugout is the characteristic craft and is here elaborated into an article possessing graceful lines and considerable beauty of workmanship. Its development, both in the matter of size and finish, was no doubt due at least partly to the size and workability of the coniferous trees of the coast region, as well as to the decreased demand for portability. A factor which must have greatly improved the product of the last century or two is the introduction of modern tools. Huge sea-faring dugouts were, and are still occasionally, made by the Haida and neighboring tribes of the northern Pacific Coast.

An interesting feature of construction is the retention of the simple or primitive method of alternate charring and hacking in hollowing-out the interior. The final adzing imparts a fine scale-like appearance. When the adzing has been completed the canoes are given additional beam by filling with water, which is heated with stones, after which the sides are forced apart by means of thwarts.

British Columbian dugouts in general bear a degree of interresemblance in outline and structure that suggests a common cultural or intercultural origin. A groove inside the stern provides a rest for the whaling and sealing harpoon.

The eastern dugouts, already described, though possessing some broad features of resemblance to

those of the West Coast, are sufficiently different in general character to suggest a development under differing conditions.

RAFTS.

The raft is at least the crudest of the navigatory devices mentioned and possesses a distribution which is practically universal, though used in many regions merely as an occasional or emergency craft. Its form is usually extremely simple and seldom exhibits anything which can be dignified by the name of design or style, though occasionally there are exceptions to this. The balsa, found among certain California Indians and in isolated localities southward to Chili, is really a raft composed of bunches of tule or rushes tied together, although its pointed ends give it some resemblance to a canoe.

Regarding the northern Déné, we have the statement of Morice to the effect that they occasionally make use of rafts. "They are made of three dry logs bound together, with their larger ends aft, while a slightly tapering shape is given their opposite extremities. The logs are fastened together fore and aft by means of ropes, which, when of truly aboriginal make, are of twisted strips or willow bark, starting from one end of a crossbar placed over them and going round each of the logs and the bar alternately. Among the Loucheux, these primitive embarkations are used in combination with regular canoes."¹³

GENERAL REMARKS.

Decking, so prominent in Eskimo canoes, has been observed to be less extensive in the Dog-rib bark canoe, and still slighter in the Chipewyan, Algonquin and Malecite. It is interesting, however, to find it outside the Eskimo region. The side flaps of the Algonquin and Malecite and some Ojibwa decking sheets have been already referred to.

Sewing, like covering materials, exhibits changes based on geographical location, these consisting mainly of a transition from sinew (used by the Eskimo) to spruce root (used by nearly all Canadian tribes excepting the Eskimo and Kutchin); or, in a few cases, to the bast or inner bark of the basswood and elm (used by the Iroquois).

The seams in all bark canoes are gummed.

The wide, flat rib is characteristic of the Eastern Woodlands and extends westward to the Slave country. This is accompanied by an inside sheeting which covers the bark completely. Contrasted with the wide, flat rib, though not differing from it in principle, is the narrow and widely-spaced rib of the Eskimo, Kutchin and Dog-rib crafts.

A feature which seems to be closely associated with the birch-bark canoe in general is the separate strip or piece used to give shape to the bow and stern respectively. These are also possessed by the

¹³Morice, A. G., "The Great Déné Race," *Anthropos*, vol. 5, p. 443.

Kutchin skin canoe. In the Eskimo canoes they are continuous with the central strip along the bottom.

The differences in outline, which constitute the most striking superficial variations among the canoes described, are dependent principally upon the shape of the end strips or "fashion-pieces" just referred to. A reference to Plates 1 and 2 will show that a series may be found starting with a very simply curved bow and stern piece (Kutchin and Dog-rib) and proceeding to one having an almost perpendicular upper portion (Algonquin and Malecite), and from the latter form to one which is considerably recurved (Slave, Chipewyan, Ojibwa, Montagnais, Micmac).

The gunwale is another interesting item. Among the Slaves and the neighboring Dog-ribs there are two gunwale strips, an inside and an outside, bound at intervals with the sewing or binding material. A similar feature links together the Algonquin and the Malecite. An inside gunwale to which the upper edge of the covering is sewn continuously, is found among the Chipewyan, Ojibwa, Montagnais and Micmac. An upper or top gunwale characterizes all the Algonkian canoes. The Algonquin and Malecite have consequently all three gunwales; inside, outside, and top. The maximum of protection or reinforcement is evidently gained by this employment of three protective strips along the upper edge, although at some addition of weight.

THE FLORA OF KAPUSKASING AND VICINITY.

BY CAPT. T. W. KIRKCONNELL.

Pastures new are always seen through an alluring mist of anticipation, and when, some two years ago, it was my military misfortune but botanical privilege to be detailed for duty on the staff of Kapuskasing Internment Camp in further New Ontario, I waited with intense interest for my first opportunities for exploration. During my exile, unkind weather and strenuous duties have permitted far fewer local excursions than I had hoped for, yet I have been able to gain a fair approximate knowledge of the sub-arctic conditions that obtain here and of the vegetation which they have evolved.

Kapuskasing, in the so-called "Clay Belt," is situated on a river of the same name which joins the Mattagami, about one hundred miles from James Bay. The region exemplifies in its flora the inevitable selection power of rainfall, temperature, and soil. Lying within the path of the broad cyclonic disturbances that traverse North America from the southwest, it has an abundant rainfall and is consequently completely forested, except in the extreme north where under duress of temperature trees give place to scrubs. It also borders on the great north-western reservoir of high pressure and so tastes the first bitter cold of anticyclonic gales. The menace of winter is felt throughout the greater part of the year, and during 1918 frost was registered in every month without exception. The great penetration of the winter frosts cannot fail to have a discouraging effect on plant life. During August, 1918, a drain was being dug through the camp at Kapuskasing and ice was encountered at a depth of four feet. Snow also persists in the bush until late in the summer. As a result, only species that are exceedingly toler-

ant of cold have survived the selection of ages, and even existing life is dwarfed and stunted. Finally, the soil almost everywhere is a heavy clay resting on gneiss and covered with from one to four feet of rich vegetable mould. Thousands of square miles have absolute homogeneity of conditions and the flora shows like lack of variety.

The change from Southern Ontario is marked and complete. As one travels northward from North Bay, the transition in the character of the forestation cannot fail to attract attention. In the long climb into the rock country deciduous trees are left behind more and more; white pine is supreme in parts of the Timagami area, but before Cobalt is reached the last white pine has disappeared; and in descending into the Great Clay Bog of the North one sees mile after weary mile of stunted spruce (*Picea mariana*), broken at intervals by ridges of poplar (*Populus balsamifera*), aspen (*Populus tremuloides*), and birch (*Betula alba*). First impressions of the endless leagues of spruce are peculiar. One might almost, by a stretch of the imagination, conceive of the scene being laid in Paleozoic times amid the forest of progressive Equisetales and Lepidodendreae which clothed the lower James Bay slope when the world was some æons younger. Closer inspection finds other trees eking out a minority existence. Cedar grows along river-bottoms, as do Alder and Willows. Balsam and Jackpine (*Pinus Banksiana*) are occasionally found, and the Mountain Ash (*Pyrus americana*) flourishes as a large shrub on higher ground. Any tamarack that I have found has been dead, apparently the victim of the Larch Sawfly.

My first botanical survey of the bush country impressed me more with the abundance of the species that were missing than with that of those present. After the swamps and bogs of Southern Ontario the new field seemed miserable and poverty-stricken. One of my earliest quests was for orchids. In Old Ontario I was on speaking terms with some thirty-two of these little aristocrats and the possibility of making some new acquaintance among them always added the keenest zest to a day's botanizing. Kapuskasing has treated me but poorly in this regard for here I have met only four species, all familiar. I found some *Habenaria hyperborea* growing sturdily in the lush grass beside the railway track, a common enough acquaintance before, but welcome now for the family's sake. Later search located

than two or three blossoms at a time, but here I could count thirty within a radius of three paces and over a hundred in sight. I felt myself a second Odysseus in Ogygia, with the rôles of infatuation reversed, and it finally needed the Hermes of a ravening appetite to tear me away from the spot.

Nor are orchids the only rare visitors; for even plebeians are very sparsely distributed here. The spring woods show few of the familiar faces of the south—no Hepaticas, White or Purple Trilliums, Bellworts, Leeks, or Dog Tooth Violets. I have found a few unhealthy specimens of *Sanguinaria canadensis*, *Viola cucullata*, and *Anemone parviflora*, but there is little else reminiscent of an Old Ontario spring. *Trillium cernuum*, a smaller plant than its brother *T. grandiflorum*, and characterized



Weiswinin Falls, May 22, 1917.

Microstylis monophyllos and *Corallorrhiza trifida* on a damp, wooded hillside. They, too, were not prizes to bear home in triumph for the admiration of friends—poor, shy slips of green, they are the despised Cinderellas of their kind, with just a touch of inherited grace in their soberness. But one pleasant surprise was in store for me. I was tramping one mild June day through an open spruce woods that crowns the steep bank just below Weiswinin falls on the Kapuskasing. There was little undergrowth but a wonderful carpet of moss, a most beautiful display of *Hypnum Crista-castrensis* spread out like elfin ferns. Then suddenly I burst into an enchanted glade and saw the ground dotted with gems of purple and white and gold. It was the most wonderful bed of *Calypso borealis* that I have ever seen. I had never before come across more

by a recurved peduncle whereby the blossom hides its face among the leaves whorled below, is met with occasionally. *Coptis trifolia* is plentiful in June.

The slashed clearings and "brûlé" have a somewhat different flora from the woods. The first-comer to push through the mould was a stranger to me, and one whom I have never identified to my complete satisfaction in Gray. In the main it seems to answer to the description of *Anaphalis margaritacea*, var. *occidentalis*, being an erect diœcious composite, with linear-lanceolate, subtomentose leaves and small whitish florets. It is, however, more fleshy and herbaceous than the Pearly Everlasting, flourishes in mucky loam, and never attains more than 3 dcm. in height. *Corydalis aurea* and *C. sempervirens* are ubiquitous in burnt-over areas, their supremacy being undisputed until the later arrival of

Epilobium angustifolium and *Cirsium muticum*. An abundant companion of these is *Mertensia paniculata*, a sturdy vagabond with purplish-blue flowers, handsome when young but becoming disreputable with age. *Caltha palustris* and *Veronica americana* succeed one another along swampy rills. The Crowfoots are represented by *Ranunculus abortivus*, plain but hardy, *R. pennsylvanicus*, and our childhood friend, *R. acris*. There is not much further change until autumn, when Asters and Goldenrods brighten the fields for a season.

Bog societies present little that is new. *Sphagnum* Moss, Labrador Tea, Laurel (*Kalmia polifolia*), *Linnaea borealis* with its delicate twin blossoms, *Galium boreale*, *Pyrola chlorantha*, *Pyrola asarifolia*, *Moneses uniflora*, and quaint *Mitella nuda* are perhaps representative. I have yet to find the Pitcher-plant, Sundew, Valerian, and Gaultheria. Where spruce bog thins out into poplar knolls you find *Actaea rubra*, *Apocynum androsaemifolium*, *Aralia nudicaulis*, *Prunella vulgaris*, and sometimes a patch of *Pedicularis canadensis*.

Ecologically, one might almost speak of "portage societies" for I have found the open ground about portages a rich hunting-ground for species lacking elsewhere. There, outcropping gneiss is thinly upholstered with sod and abundant moisture tempers frosts and fosters vegetation. At the foot of rocky cliffs just below Kabahose falls, a forty-foot cataract some twelve miles south of the camp, I discovered last June an Eldorado of *Primula mistassinica*, a charming little flower, easily rivalling *Campanula rotundifolia* in grace; and when scattered along the brim of a magnificent foam-flecked pool of black water, it was doubly beautiful. Another "find" in the same spot was *Clematis verticillaris*. Beside Weiswinin falls, too, I gathered in a goodly harvest during the summer months. Blue-eyed Grass (*Sisyrinchium angustifolium*), two less common Cinquefoils, *Potentilla fruticosa* and *P. tridentata*, and two unfamiliar Fleabanes, *Erigeron hyssopifolius* and *E. racemosus* grew there in abundance, along with *Aquilegia canadensis* and *Lilium philadelphicum*.

Weeds, the *profanum vulgus* of civilized fields, have immigrated but little so far, and the few ruffians to be found in this new country can be blamed on balast and poor seed. My rogue's gallery comprises the Catchfly (*Silene noctiflora*), Chickweed (*Stellaria media*), Ox-eye Daisy (*Chrysanthemum Leucanthemum*), Vetch (*Vicia Cracca*), Hound's Tongue (*Cynoglossum officinale*), and Shepherd's Purse (*Capsella bursa-pastoris*), but none grow yet in sufficient quantities to harrass the farmer.

Cryptogamic life I must dismiss briefly. Ferns are less plentiful than further south, but there is an abundance of Bracken, Bladder Fern, Maidenhair Fern, and Oak Fern. The Equisetaceae are well represented, and there is a great plenitude of Lycopods, especially *Lycopodium clavatum*, *L. dendroideum*, and *L. complanatum*. Many glades on higher ground can boast of a charming Lilliputian forest of these dwindling descendants of the Coal Measures. Mosses abound in the woods and are exuberant under portage conditions, *Bryum* and *Hypnum* forms predominating as usual. New "brûlé" is often a moist mass of Liverworts. Among fungi my most welcome finds were *Coprinus micaceus* and *Morchella deliciosa*, and these I did my best to exterminate.

A man of grass will be pardoned for venturing a few closing remarks on the zoology of the district. The only fish in the Kapuskasing river are pike, pickerel, black bass, and suckers, all of small size. Precipitous falls between here and James Bay apparently discourage ichthyic development. Insect life is plentiful (my fellow officers wax profane over armed hosts of *Anopheles*) but lacks the variety of the lower latitudes. In seeking Coleoptera I have found the Buprestidae and Cerambycidae well represented, while my Pay Sergeant, Alex. Miller, of Toronto, whose hobby runs to butterflies, captured some thirty-six different Rhopalocera during the summer of 1918, chiefly of the genera *Argynnis*, *Brenthis*, *Crapta*, *Vanessa*, *Lycaena*, and *Pieris*.

My register of birds totals about forty to date. The Whiskey Jack (*Perisoreus canadensis*), the Arctic Redpoll (*Acanthis linaria*), and the Snowflake (*Plectrophenax nivalis*) winter with us, the latter two whirling about in flocks of hundreds. Spring brings Horned Larks and Juncoes, and later on Robins, Song Sparrows, Phoebe, and the Veery Thrush. I have seen very, very few warblers. Ducks, Rails, Bitterns, and Sandpipers haunt the swamper stretches of the river, and a pair of Herring Gulls (*Larus argentatus*) have returned here summer after summer to fatten on the garbage from the internment camp. Our most distinguished visitor has been a Snowy Owl (*Nyctea*) who lit a few feet from my office door one cloudy noon last November. He was a magnificent specimen, white without a sullying fleck, and must have measured four feet from tip to tip of his great wings. We were permitted to step almost up to him before he took to flight and floated noiselessly away. Had murder been desired, a child could have shot him.

BIRD PROTECTION IN CANADA.

Canadian conservationists are to be congratulated upon the success so far achieved in bird protection in the Dominion. Probably the most important step ever taken in any country in this direction is the ratification of the International Migratory Bird Convention with the United States whereby the two great North American powers are bound to co-operate in the protection of migratory game and other birds. This is now the law of the land and founded upon international treaty.

In addition to a number of bird reservations created in the west we have lately achieved the following in the east: Point Pelee, Ontario, on Lake Erie, established as a wild life sanctuary; its unique bird life will be permanently retained in coming Canadian generations and a place reserved for them where they may see and hear the Mocking Bird, Cardinal, Carolina Wren and other southern birds of song and story within our own borders.

Lately, a bill has passed the Quebec Parliament preserving Percé Rock, the bird ledges of Bonaventure Island, and Bird Rock, all in the Gulf Coast, as permanent bird havens, and the threatened destruction of some of our national wonders is prevented.

The next serious protection problem is the condition of bird life on the north shore of the Gulf of St. Lawrence, the "Canadian Labrador." To-day we have every reason for serious effort in this direction,—economic, that a necessary food supply shall not be lost to the inhabitants of this bleak and desolate coast; sentimental, that no form of innocent life perish from the face of the earth; and moral, that we live up to the conditions and responsibilities imposed upon us and agreed to by us in the solemn treaty we have entered into. The following correspondence from those who speak from first hand observation on the Labrador coast, will indicate how critical this question is and how necessary it is that all join together in assisting and supporting Dominion officials in this direction.

BOSTON, MASS., DECEMBER 11, 1918.

To the Editor of THE OTTAWA NATURALIST:

The following note received by me from Dr. Robert T. Morris, of New York, which he has allowed me to use in any way that will do good, is deserving of the widest publicity.

The chapter he refers to in my book was published in advance in 1916 in the seventh annual report of the Commission of Conservation of Canada, and describes in detail the terrible destruction of bird life on the coast of the Labrador Peninsula. The subject is so important, if the bird life of this region is to be saved, that I have taken the lib-

erty of quoting from this chapter some suggestions which I believe to be of vital importance.

"What then is to be done? Is there no hope for the birds and for the people to whom the birds are such a valuable asset? I think there is. I believe that the whole problem can be solved most rationally and satisfactorily for all concerned by the immediate establishment of *bird reservations*. These should be islands or groups of islands or suitable portions of the main coast that can be watched by guardians. Here the birds should be undisturbed and allowed to rest, feed and breed in peace. The people should be made to understand that these reservations are not established to cut down their hunting, and thereby invite poaching and violation of the laws, but for the purpose of preserving and increasing the birds so that there shall be better shooting for everybody on the coast.

"A campaign of education is necessary, therefore, and I believe that the bird reservation will do more good in making the people understand, not only the need of bird conservation, but its advantages. The game wardens will be looked upon, not as enemies to be avoided and cheated, but as friends who are working for the people's good. If the matter is well managed, the people will regard their reservation with pride, and public opinion will keep the birds there inviolate. The wasted regions near fishing villages now devoid of all sea-bird life on the one hand and the crowded bird reservations on the other will be powerful object lessons in this process of education. I would suggest the placing of a brief notice on each reservation, printed in English, as well as in French, Montagnais or Eskimo, where these languages are used, worded somewhat as follows:

"BIRD RESERVATION

"The purpose of this reservation is to preserve the birds from destruction and to increase their numbers, so that there will be better shooting on the coast. The people are asked not to disturb the birds or their eggs on this reservation and to avoid the use of guns in its neighborhood."

CHARLES W. TOWNSEND.

616 Madison Ave.,

NEW YORK CITY, NOVEMBER 15, 1918.

To DR. CHARLES WENDELL TOWNSEND,

98 Pinckney St.,

Boston, Massachusetts.

Your treatment of the subject of conservation in Labrador in the book, "In Audubon's Labrador", which I have read with great interest, meets with my approval or more than that. On my trips to the Gulf Coast of Labrador and on the eastern coast

as far north as Hamilton Inlet, I observed that the Newfoundland cod fishermen were in the habit of raiding all the islands and adjacent mainlands on Sunday and making way with the eggs and the young of all the sea-birds. Some of the islands were wholly deserted so far as bird life was concerned and your Captain Joncas told me that in addition to the Newfoundland fishermen a number of men were engaged in the business of eggng and that the eggs were preserved in brine and sold to the crews of various vessels. He said that the egg hunt was continued until such a late date in the season that the young birds which finally hatched were not strong enough to withstand the autumn storms and he had seen thousands of young birds thrown up on the beaches. When I have been on the coast the Newfoundland fishermen destroyed young birds for

sport, leaving them where they fell on the ground if they were of species not good to eat.

The waste of food fish also is very great along the Labrador coast. Small cod and hake which are not desired by the fishermen are often smothered in the traps or killed when the traps are emptied and I have seen them floating for miles on the surface when the trappers were at work. The cod trappers catch a great many adult salmon by setting their nets in the channels when the salmon first make their way towards the rivers. This is illegal, but is winked at by the officials. A remarkable waste of salmon occurs in September when the herring nets are used near the coast. This is the time of year when the smelts are descending from the rivers and putting out to sea. They are captured in quantities in the herring nets.

ROBERT T. MORRIS.

BIRD MIGRATION.

BY H. MOUSLEY, HATLEY, QUE.

It is rightly said no doubt that "old traditions die hard," and therefore it is not so very surprising perhaps to find in Mr. C. B. Hutching's short note on the above subject in the November number of THE OTTAWA NATURALIST, page 97, that a writer in the *St. Louis Republic*, whilst considering the idea of birds flying in the rarified atmosphere three miles above the earth's surface, and being guided by the topography of the country at night, when flights are mostly made, as being somewhat erroneous, propounds a solution equally erroneous to my mind, when he suggests that they guide their course by means of the stars.

Speaking personally I have long ago given up cherishing "The fairy tales of science, and the long result of Time;" which to put it in a nutshell, amounts to considering birds as self-conscious animals like ourselves, instead of sub-conscious ones, governed by some impulse imperfectly known at present.

To imagine that birds are capable of shaping their course by means of such landmarks as mountains, rivers or even stars, seems to me to be somewhat far fetched, especially when we consider that a large proportion of them migrate at night, and sometimes on the very darkest nights too, when all of these landmarks, including the stars, would be invisible. No, there must be some other explanation to account for this unerring intuition (or call it what you like) in the animal world, and that explanation lies in the fact, I think, that in pure nature there is no such thing as self-consciousness, or the power of reason-

ing, although some of the higher animals, such as dogs, horses, etc., from long and intimate association with man, no doubt at times display traces of it, in the same way that some human beings are still abnormally susceptible to subconscious impressions, a relic of conditions existing before the evolution of self-conscious mind.

All wild birds and animals however I believe are subconscious, and therein lies the secret of their making no mistakes, for they do not reason as human beings do, but know just what ought to be done, and when and how to do it, in the same way as the larva knows exactly when it is full fed and must pupate, as well as where and when and how that process is to be accomplished, and the birds the time of migration, the nesting period, the rearing of their young, and the time to return to their winter quarters, without the aid of any landmarks whatsoever in either case. To understand this more fully one must be prepared to accept the fact that telepathy (now recognized by science, but which up to the present we have been unable to turn to practical account by mechanical means as in the case of the Marconi wireless system) pervades and is general throughout the entire animal kingdom. It is a potential faculty (working on an astral plane unknown to us at present) which inter-connects sub-conscious mind, and permits silent intercourse to become established. But just as in the case of electricity and wireless telegraphy, electric force must pass in the one case along a wire connector, in the other through a psycho physical medium (ether) before it

can be energized, so in the case of telepathy and telæsthesia which if not identical with electricity operate much in the same way, a circuitous connection must be established before results can be obtained. These results in the case of telæsthesia are no doubt enhanced by the cover of darkness (just as they are said to be in the case of the Marconi system) this accounting no doubt for so many birds migrating at night. In telepathy (mind blending) and telæsthesia (perception at a distance, or power of vision passing the limits of time and space) however the forces operate through a medium not apparent at present to our sense, and therefore we cannot determine the necessary conditions, or realize their full significance, but this may possibly be an open book some day, when sufficient time can be given to the study of life functioning on a plane other than our own.

My studies in the field of late have more and more convinced me that in telepathy and telæsthesia we have the means of answering some of those awkward questions which are for ever perplexing the

followers and believers in the old idea that birds are self-conscious beings, and perform their wonderful feats by a process of reasoning. As a matter of fact these facts are not so very wonderful as natural, because they belong to the infallibility of a subconscious, and not to the reasonings and hence mistakes of a self-conscious mind.

In conclusion I see in the late war one of the most definite proofs against the belief that birds are self-conscious for had they been so they would surely have forsaken the battlefields of France and Flanders, which has not been the case. The residents have remained just as usual, and the migrants have come and gone likewise. Thus in face of danger of which they know nothing the birds have kept on the same course and frequented the same places, which for countless ages have been their custom, and despite the noise of battle have nested as heretofore, surely a proof that they do not act on their own responsibility, but are dependent on the ruling of their subconscious minds.

THE WHITE PELICAN, *PELECANUS ERYTHORHYNCHOS*, IN ALBERTA

By F. L. FARLEY, CAMROSE, ALTA.

Sometime in the summer of 1908, I heard of an island in a lake about 18 miles north of Camrose, where a large number of White Pelicans nested. After more enquiries I learned that the island was in the furthestmost North Miquelon lake, one of several beautiful small bodies of water lying to the south of the Beaver Hills. At the time there were practically no trails leading into that new country, and with one exception no land had been taken up around the lakes; it was therefore in its natural state. I was not able to visit the island until the shooting season opened, when a friend and I drove to the lower lake, and with a row boat worked our way through this and the middle lake, and made a short passage into what we named Pelican lake. This body of water is about two miles long by one mile in width and the timber grows to within a few feet of the high water line. The island is quite discernible about one mile out in the lake. The two outstanding features were the several large nests up in the trees, which turned out to belong to the Great Blue Heron, and the large wave of white which seemed to cover the eastern shore of the island. As we came near this apparent white wave turned out to be Pelicans, some of which were on the beach and others close by in the water.

Before we approached to within 500 yards, those that were not in the water joined the others, and

swam around the south side of the island, and upon our speeding up, they arose, a few at a time, and before we reached the shore the whole flock was high in the air, moving in wonderful formations almost immediately overhead. A small flock seemed to be particularly interested in us and came down to within close range, so close that the black markings showed quite clearly. Others were probably half a mile high, and about half the flock were at such an altitude that they did not look larger than small gulls. When a flock of these birds are wheeling and circling in a close set company of from ten to fifty, their appearance in the air is one of almost unbelievable change. When they are sailing in such a way as to present their horizontal aspect to the distant observer, they are nearly lost to view, but when they are banking for a turn, there comes to view a wonderful brilliance of white wings and bodies, flashing in the sunshine, beautiful beyond the powers of one's mind to imagine, and at a distance of a mile or two the transcendent ease and grace of their flight is intensified, because all hint of effort and of wing motion is lost to the observer.

We remained on the island for about an hour, and before we left the lake the birds had alighted on a long stony bar a short distance to the west of the island. Our estimate of the number of Pelicans, after failing to count them several times, was

about 500. The island is less than two acres in extent. The east end slopes to the water and is quite narrow, and from there to the western extremity the ground gradually rises until it is about fifteen feet above the water. There were at that time about one dozen Balm of Gilead trees, a few willows, and one spruce tree, mostly on the higher part of the island, some of which were dead. The Balm of Gilead trees were about one foot in diameter and thirty to forty feet high. The only grass that grew on the island was close to the waters edge. A very strong growth of nettles covered practically all the higher part of the island. Running through the centre of the island from the south there was a small depression on which nothing was growing, and it was here that the Pelicans nested. Scattered all over this sandy loam were hundreds of eggs which had never hatched, now entirely dried up inside. These were about the size of goose eggs, but the surface was quite rough and chalky.

On May 29 in the following year, 1909, I visited the island again and found about the same number of Pelicans. Most of them on my approach were out on the stony bar, but there were about fifty up the little draw where the eggs were on our first visit. Before I landed these quietly walked to the water and swam away to join the others. The stench that seemed to be everywhere after leaving the water, was beyond description, and I thought it would be impossible to remain long enough to make the investigations I hoped to. However, I soon got used to it; perhaps I forgot it when all the varied sights came before me. Climbing up the bank I soon came to the nests, some with eggs inside, but often with as many outside. The nests were nothing more than depressions in the loam, with a slight banking up on the outside. There was no lining whatever, and it was evident that different birds used the same nests, from the various sizes of the eggs. The number of eggs varied from one to five, and at this date they were very little incubated. About one-third of the eggs were scattered here and there over this part of the island, some quite a distance from any nest, and I concluded that these must have been thrown out by the birds when they left the nests hurriedly, as no doubt they are very clumsy in their movements on land. This, then, would explain the great number of eggs that were not hatched the previous year.

During my inspection of this breeding ground there were many other sights on all sides to interest one. Up in the larger trees there were Great Blue Herons, some on their nests, and others keeping guard. On the small trees were about a dozen Double Crested

Cormorants, some of which were setting on their nests of three and four beautiful bluish eggs. These nests were small and flat, built of sticks and put together very loosely. In a hollow stump I found a Golden-Eye setting on a nest full of eggs. A little further on, a Mallard flew up from her nest of well incubated eggs. House Wrens, Yellow Warblers, Yellowthroats, and Tree Swallows were nesting on the island, and on the shore Spotted Sandpipers and Yellow Legs were feeding.

The following July another visit was made, and as the island was approached the Pelicans came to meet us. Up on the island we could see what looked like a small flock of sheep huddled together. These proved to be the young Pelicans, the entire increase for the year of this colony, nineteen only. It seemed a tragedy to think of this small number from perhaps six hundred eggs. There were the usual number of unhatched eggs lying around, at least several hundred. As I moved toward the young ones they waddled off slowly, but gave no note of alarm. Some of the old birds flew down over the island, and very rarely gave a small cry, this was the only note I ever heard from them. The stench at this time was even worse than in May, likely due to the number of dead fish lying around, which were partly decomposed. About a month later when motoring through the lake we came onto the little flock of young, still nineteen in number.

The following two or three years this colony used the island for their summer home, but the land around the lake was gradually being taken up, and no doubt farm boys wanted to see the big birds, and this with the ever increasing number of motor boats on the lakes, must have disturbed the Pelicans so much that they deserted it entirely. The Government made the lake a preserve and appointed one of the settlers a guardian, who posted notices forbidding anyone landing on the island, but it was too late, and people are wondering where the former owners of the island have gone. A half-breed told me that many years ago the Pelicans nested on all the islands in these lakes, and that they were as plentiful as geese in the fall. He said the Cree name for them was Cha-Chac-Kw.

Last fall, Dr. R. M. Anderson, of the Canadian Geological Survey, and I spent some time on Pelican island, and there were no signs whatever of Pelicans being there during recent years. All the trees had fallen and the entire surface of the island was covered with nettles. I never saw a Pelican migrating, and as Camrose is directly south of where this colony lived, I am of the opinion that they must come and go by night, or they would have been noticed passing over.

NOTES AND OBSERVATIONS.

Mr. Levi Penney of Woodlawn, Ontario, reported an unusual abundance of fall ducks in Constant bay on the Ottawa river, and attributes the phenomenon to the epidemic, during the shooting season, of influenza, which in various ways prevented the exodus of city gunners.

CLYDE L. PATCH, OTTAWA.

Last fall while rabbit hunting near Ottawa, Mr. Phil. Brady observed, resting about ten feet from the ground in a cedar tree, a Screech Owl which held in its claws an adult Ruffed Grouse. The death of the grouse, the throat of which was torn, cannot with certainty be credited to the owl which may have secured it after it had been killed by another agent; nevertheless the remarkable fact remains that the owl had sufficient strength to carry the grouse to an elevation of ten feet.

CLYDE L. PATCH, OTTAWA.

AN HERMAPHRODITE LOBSTER.—In the month of November, 1917, whilst engaged in making special observations on the lobster at Bay View, Pictou county, N.S., I found in a fisherman's trap, just after it had been drawn out of the sea, a lobster which was absolutely male on the left side and absolutely female on the right side. The specimen was sent intact to Dr. A. P. Knight, Queen's University, Kingston, Ont., with whom I was associated. This find was surely a remarkable one.

ANDREW HALKETT.

Reading Mr. Harlan I. Smith's note in a recent issue of THE OTTAWA NATURALIST, I am reminded of a mishap which befell another bird some years ago. While passing one of the fine spruces on the grounds of the Ontario Agricultural College, Guelph, my attention was arrested by a fluttering of wings among the branches, which I found to come from a robin dangling by the tail from a tuft of twigs. Excited by my closer approach the bird managed to free itself, leaving behind a half-dozen tail feathers, which proved to be firmly glued to their anchorage by means of ordinary tar! Presumably it had come here and perched, perhaps over night, within tail's-length of the unfriendly mesh of branchlets, after having first frequented some newly-tarred surface in which the tips of the feathers had become daubed.

HERBERT GROH, PRESTON, ONT.

THE CANADA JAY.—There are few campers in the northern woods of Ontario who have not met with the Canada Jay (*Perisoreus canadensis*), one

of the most delightful of birds in spite of its bad qualities—Wis-Ka-Tjan or thief the Indians call it; it has well earned its reputation. The lumbermen have corrupted the name into Whiskey Jack and if any of their number misses some whiskey he is advised to go to this bird for information. Not only will this bird steal everything in the way of food about a camp, but we are sorry to say it will also eat the eggs of other birds as well as their young. If it were not for these bad qualities the most appropriate name for it would be "The Grey Nun" for with its beautiful grey color—white forehead, white throat and black at back of head and neck, also its delightfully soft eyes and gentle manner, it is typical of the nun. Although not seen in large flocks, half-a-dozen or more may often be met, and when they discover a camp in the woods there is great jubilation, we might say laughter, for their note at this time is much like laughter.

It might be supposed that a few such birds, somewhat less than eleven inches in length, could not make much impression on a hanging deer, and the camper would be surprised to find that one of his best haunches had disappeared in a few hours, this taken piecemeal and most of it hidden for future use. Last September when watching these birds it was noticed that they did not carry all their supplies to one place, but to several places and they were often tucked away between a hanging piece of bark and the trunk of the tree.

The Whiskey Jack is probably the easiest of any of our birds to tame. When camping not long ago, and while preparing a duck for cooking, in which one of these birds was much interested, it was induced to come and peck at the duck. Having once tasted this delicious morsel it forgot all fear, and drawing the duck gradually nearer the writer played hide and seek with it round his body and over his thighs the Whiskey Jack following. From that date this bird became our pet and would freely eat out of our hands. It would also come into our tent and wake us up by walking over us if breakfast was delayed too long.

F. F. PAYNE.

AN EPIDEMIC OF ROUP IN THE CROW ROOSTS OF THE LOWER THAMES RIVER, KENT CO., ONT.—Residents of the lower Thames valley, west of Chatham, Ont., report that large numbers of crows regularly winter in western Kent county and roost in the orchards and groves along the river. Mr. John Johnston says in a letter to the writer that "the date when the crows first wintered here was about 1895. It was a mild winter and a very late fall, and not a great deal of snow. They started

to gather in flocks about October. The number I should judge, would be well up in the thousands and it has materially increased ever since. They fed principally on corn and dead animals and also on garbage in the towns. Every time we had a cold spell hundreds of them died. I am told that the place where they have been in the habit of roosting (McGavin's) the ground is now (Feb. 10 h, 1918) covered with dead crows."

Mr. William Holmes residing about 4 miles below Chatham, relates that there was a great flight of crows in 1904, large numbers remaining all winter feeding on the corn left standing in the fields, or in the fields in stooks. Thousands died. As Mr. Holmes protected the crows on his property, his orchard of 400 trees was "literally packed, and the ground underneath (was also) packed, and the pigs (were) busy every day for weeks eating the frozen and blind, as there seemed to be a disease of the eyes, a white film growth over the eyeball. Though they seemed healthy and strong (they) would walk around as blind as a bat." They remained with him until late in the spring.

There is no doubt but that the affection from which the crows were suffering was the same as that

described by Eldon Howard Eaton* as occurring in the Canandaigua Crow Roost of New York State in December, 1901. This disease he determined to be "roup," and his description of "the eyes" being "usually blinded by a membrane forming over the exterior of the cornea" agrees accurately with Mr. Holmes' description given above. Eaton states that the disease did not appear either "in the Rochester roost or in that near Niagara Falls" . . . "the disease disappeared with the coming warm weather." The last evidence of it noted by Eaton was on April 6. He states "it is probable that one thousand crows died of this disease during the last winter in Ontario county."

Both Mr. Johnston and Mr. Holmes believe that the crows assisted in the spread of the San Jose scale, which Mr. Johnston states was first introduced into the orchards along the Lake Erie shore on nursery stock from the United States. Mr. Holmes informed me that the scale made its first appearance in his orchards the summer following the great flight of crows, and in spite of all his endeavors to check it, in three years' time it had "won out." The whole orchard along the river was killed.

M. Y. WILLIAMS.

*Auk, Vol. XX, 1903, pp. 57-59.

BOOK NOTICES AND REVIEWS.

CLASS BOOK OF ECONOMIC ENTOMOLOGY, with special reference to the economic insects of the Northern United States and Canada. Philadelphia: P. Blakeston's Son & Co., 436 pp., 257 illustrations; price \$2.50.

We were much pleased to see this new volume on insects, prepared by one of our own members—one who is held in high regard by entomologists generally not only throughout Canada, but the United States as well. The volume is a class book of Economic Entomology, with special reference to the economic insects of the Northern United States and Canada. It is a companion volume to Reese's book on Economic Zoology. It is divided into four parts: Part I, discusses the structure, growth and economics of insects; Part II, the identification of insects injurious to farm, garden and orchard crops, etc.; Part III, the classification and description of common insects; Part IV, the control of injurious insects.

Briefly, this new book on Economic Entomology is one which undoubtedly will be well received. It will certainly find a useful place among economic students. The descriptions are concise and to the point, the illustrations well chosen and the printing excellent.—A.G.

THE WORKS OF J. HENRI FABRE. Translated by Teixeira De Mattos. N.Y., Dod, Mead & Co. The writings of the great French naturalist, J. Henri Fabre are only now becoming widely known though the writer was a contemporary of Darwin. To those who do not understand French, these works are now available in their entirety by the English translation.

To the entomologist of the old school who studies nature for the wonders of her works rather than for the shekels which are now offered to a professional student, these volumes will prove a delight, which we believe, has never before been equalled in the realms of science. Nor should they be neglected by the professional who will discover in their contents, details in observation in methods of study and in habits that must prove of great value even to the most proficient.

It is, perhaps, enough in this short notice to say that these works are teeming with facts presented in a manner that only a Frenchman seems capable of, and this lucidity seems to have been fully maintained by the translator.

These works are, to all intents and purposes, without technical language and deal with a great range of subjects as will be noted from the following titles already published: "The Life of the Spider",

"The Life of the Fly", "The Mason Bees", "Bramble Bees and Others", "The Hunting Wasps", "The Life of the Caterpillar", "The Life of the Grasshopper", "The Sacred Beetle and Others".

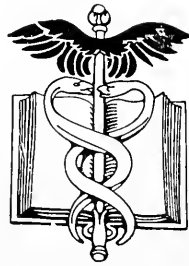
To review such a remarkable series of works in so short a space is impossible nor has it been attempted. It is enough to say that under each title are provided the life habits of many different insects told with a charm that turns the tedium of ordinary technical science into the wonders of a fairy tale, and yet in the transformation does not at all overstep the realms of truth.

These writings should prove a source of delight alike to the young and grown-ups, and for the parents who wish to instill a knowledge of nature into their children, free from the too common imaginary teachings of to-day, we know of no books that should prove more suitable or more readable, than those of J. Henri Fabre.—N. C.

KEY TO THE ROCKY MOUNTAIN FLORA, by P. A. Rydberg, Ph.D., Curator, New York Botanical Garden: Published by the author; price \$1.60 post paid.

When Dr. Rydberg published his "Flora of the Rocky Mountains and Adjacent Plains," which was

reviewed in "The Ottawa Naturalist" a year ago, field botanists immediately felt the need of something less bulky than a large volume of more than 1,100 pages. Dr. Rydberg has now filled this want in a manner that will please and satisfy both field and herbarium botanists. The recently published Key is a reprint in a somewhat different form of all the keys published in the Flora, and these keys with an excellent glossary and index make a handy little volume of 306 pages of 5x8 inches and less than half an inch thick which can be carried in any ordinary pocket. The Key may in this way be used independently of the Flora and fresh growing specimens be studied before they are collected. Another use to which the Key can be put is in the listing and checking of local floras, an initial letter or some arbitrary sign being used to indicate particular localities, countries or provinces. As the Key covers not only the flora of the Rocky Mountains, but also that of the provinces of Alberta and Saskatchewan and the Kootenay Districts of British Columbia, it should be in the hands not only of all western botanists but of all school-teachers, ranchers, farmers and others who are interested in knowing the names of the flowers which grow near their homes.—J. M.





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NOTES ON CANADIAN WEASELS.

By J. DEWEY SOPER.

THE LEAST WEASEL, *Mustela rixosa* (Bangs).

This diminutive carnivore is doubtless the least known of the North American weasels. About fifteen records all told, mostly from Canada, indicate both our limited knowledge and the scant possession of scientific material relative to the species. Since 1857 when Baird first described the species, data concerning its life history has accumulated slowly and even yet is of very limited extent.

The range of *rixosa*, according to Seton¹ extends in a broad band, roughly, eight or nine hundred miles in width diagonally across the continent from Montreal and the south-western extremity of Lake Superior to Alaska. As a boreal species it is restricted to the Arctic, Hudsonian, and Canadian life zones. In north-western Alaska a race of this species *P. eskimo* (Stone) is recognized, also what may prove to be a race is Rhoads'² *alleghehiensis* from Pennsylvania. Thus, theoretically, southern Ontario comes within the range of the Least Weasel, but I know of no records from the region.

The Least Weasel is not only the smallest of the weasels, but is the smallest known beast of prey in the world.

In summer, the upper parts including the tail are of an even light brown color, the under parts being pure white. The winter coat is entirely white. The tail is very short and lacks at all seasons the black tip.

As a carnivorous animal its diminutive proportions may be better appreciated when compared with a mouse for instance. The Least Weasel habitually preys on mice, but exceeds them but little in size. A glance at the following measurements of *rixosa* will reveal slight difference in this respect from the genus *Microtus*, the meadow mice, etc.

Total length about $6\frac{1}{2}$ inches (166 mm.); tail vertebrae, $1\frac{1}{4}$ inches (32 mm.); hind foot, 13-16 inches (21 mm.)

Measurements of a large meadow mouse (*M. pennsylvanicus*) taken Feb. 17, 1918, coll. No. 243,

male: Length, 168 mm.; tail, 50 mm.; foot 21 mm.

It will be noticed that the latter is the largest, but this one was of more than ordinary size.

The only place I ever came into contact with the Least Weasel is Edmonton, Alta., and even there where weasels are common only one was taken within a certain period of time, during which about one hundred and fifty of the other species were captured. This fact indicates its rarity in that region.

I found it about Nov. 13 in one of my traps, along the White-mud river, a few miles south-west of the city. It was pure white, proving it takes on its winter pelage as soon as the other species.

The locality in which it was collected was that ordinarily frequented by *M. cicognanii* and *M. longicauda*—meadow-like river-tracts sparsely overgrown with poplar. The first sight of its body made me think of an Albina meadow mouse. Even such small mammals sometimes spring the larger traps as all trappers know. To those who are unfamiliar with the many disappointments of the trap line, it may be said that after repeated failures at certain "sets" when bait disappears and traps are mysteriously sprung, a crushed shrew or deer-mouse in the jaws will at last dispel the mystery.

THE LONG-TAILED WEASEL, *Mustela longicauda* (Bonaparte).

This species, the largest of our Canadian weasels, should not be confused with others of the family. Great strength for its size is suggested in the muscular contour of its make-up. The legs are comparatively short and stout, the body compact and very muscular, and the head massively formed in alliance with its other physical proportions.

In size it approaches that of a small mink and in summer coat with hasty glance might be mistaken for one. In winter, as Seton remarks, it could easily be mistaken for a big white squirrel, that is, upon the ground. It has a closest resemblance to *M. noveboracensis* but as the range of the two species do not coincide and as extra limital occurrences are rare, little or no confusion should be experienced in the field.

¹Seton, E. T., Life Hist. of Northern Animals. Vol. II, p. 861, 1909.

²Rhoads, S. N., Mamm. of Penn. and N.J., pp. 173-176, 1903.

Except for one extra limital record by Miller³ for North Bay, the species has only been found in Canada broadly coincident with the prairie conditions of the western provinces of Manitoba, Saskatchewan, and Alberta; in the south-western portion of the former and north to 55° in the two latter. In the United States its range is south to Kansas. While it is generally recognized as a prairie dweller, the poplar forests skirting the prairies harbor great numbers, as do also to some extent the darker coniferous areas. Probably the latter fact is not generally accepted. I have personally, however, frequently collected the species about the city of Edmonton. The immediate region comprises conditions peculiar to the north-west, such as the occasional grass or prairie lands, the poplar woods of the upper country, and the deep river basins and ravines which are comparatively heavily timbered. Over all such areas around Edmonton the long-tail ranges indifferently.

In summer the species over the upper parts is pale yellowish-brown, the under parts rich ochraceous or buff yellow. The winter fur is pure white. The tail is one-third the length of the animal and the black tip one-quarter of the length of the whole tail.

Measurements as given by Seton⁴: Length about 18 inches (457 mm.); tail 6 inches (152 mm.); hind foot 2 inches (51 mm.) Female about one-seventh smaller.

With the short-tailed species, *M. cicognanii*, the Edmonton region is favorably endowed. In winter their delicate paired tracks may be seen nearly everywhere. *M. longicauda* occurs in a ratio of about one to ten of *M. cicognanii*. Under the discussion of the latter I have placed my estimate on the general and specific numbers of all the weasels found around Edmonton.

Along the Saskatchewan river numerous deep wooded ravines open out upon the valley. Within these, probably induced by a greater abundance of game in winter, a goodly number of weasels, or ermine as they are called, make their daily rounds. The spaces under the spruces and the open runs of the little frozen streams are usually at very frequent intervals indented with the innocent-looking trails. Hither and thither they lead, under wind-falls and logs, through tangled growths, into crevices or other surface openings, etc. A blood-flecked hollow reveals the tragic end of a little deer-mouse; probably at a grassy margin a meadow vole. In a sheltered hollow a huddled hare has provided a sumptuous feast for days. And so all through the bitter weeks until nature fans the land with vernal

breezes, the great white page is written again and again with signs of frolic or grim tragedy that spells life or death.

Bordering the White-mud river which flows into the Saskatchewan about two miles south-west of Edmonton I found the favorite hunting grounds of *longicauda* in the meadow-like areas on both sides. On these miniature alluvial plains in the concavity of the bends now grown to grass and scattered poplars, the weasels bounteously fared on the numberless population of shrew, mice and rabbits. Such places always suggest good weasel grounds.

NEW YORK WEASEL, *Mustela noveboracensis* (Emmonds).

In comparison with other weasels this species has a relatively restricted range within which also occurs *Mustela cicognanii*. In some sections it yields in numbers to the latter, but in other areas entirely replaces it.

The range of this species is approximately within the area bordered by an imaginary line drawn from the southern New England States, south to the Carolinas, west to the Mississippi, north to Georgian Bay, and east to Montreal. Within such area it is confined to the Canadian, Transition and Upper Austral zones.

The summer color of *M. noveboracensis* is dark brown above and white below, sometimes tinged with sulphur-yellow. In Ontario the winter coat is pure white, excepting sometimes a slight xanthic tinge on the belly, buttocks and tail. The latter is one-third of its total length and the terminal half is black (at all seasons). By this character it may readily be distinguished from *M. longicauda*, but as the range of the two species do not coincide, it will not be needed as a field mark.

The following measurements of this species are given by Rhoads⁵: Total length, male 405 mm. (16 ins.), female, 325 (12¾ ins.); tail vertebrae, male, 140 (5½ ins.), female, 108 (4½ ins.); hind foot, male, 47 (1¾ ins.), female, 34 (1¼ ins.)

In the counties of Wellington and Waterloo, of the province of Ontario, I have found this species to be much less common than *M. cicognanii*. Brooks as recorded by Miller⁶ saw weasels at Milton much larger than the latter. The species, I think, would scarcely be other than *M. noveboracensis*. Mr. W. E. Saunders, of London, Ont., has informed me that the New York Weasel is the form occurring there, and that it is common throughout the western part of the Ontario peninsula.

By a peculiar coincidence the first weasel I ever trapped in Ontario was this species. This was near

³Miller, Jr., G. S., Mammals of Ontario, Vol. 28, No. 1, 1896.

⁴Seton, E. T., Life Hist., N. Animals, Vol. II, p. 865, 1909.

⁵Rhoads, S. N., Mammals of Penn. and N. Jersey, p. 172, 1903.

⁶Miller, Jr., G. S., Mammals of Ontario, Vol. 28, No. 1, p. 44, 1896.

Rockwood. Since, I have taken numbers of the Lesser Weasel, but only, I think, two or three of the large kind. The capture of the one mentioned was purely accidental and happened in November. The seasonal change to white is not always affected by this time. Some specimens taken near Christmas time when snow was on the ground still had a few belated brown hairs over the back. Contrary to this, individuals of spotless white are occasionally taken when no snow exists. The moult from brown to white or the reverse does not seem to depend on any particular seasonal change or condition.

I recall a story told me years ago by a farmer which portrays nicely the intrepid nature of this

An interesting note by John F. Carleton, East Sandwich, Mass., entitled "Bold Mother Weasel Rescues Young" (January, 1919, *Field and Stream*) illustrates again the venturesome spirit. He says: "Some years since I was at work with my man on the edge of a dry swamp, on high land, one-eighth of a mile from Bay Shore, when I found a weasel's nest with four half-grown young in a brush heap. I regret that I cannot recall the composition of the nest. I sat down 'side-saddle,' took up the four young and placed them in the outside left breast-pocket of my coat, my man standing near. Soon the mother appeared hunting for her young. I placed one on my knee; the mother soon scented it, jumped on my knee, grabbed the little



TAILS OF WEASELS (WINTER FUR)—ONE-HALF NATURAL SIZE.

a—*Putorius rixosus*.

b—*Putorius cicognani*.

c—*Putorius noveboracensis*.

d—*Putorius longicauda*.

animal. While working in the fields he heard high overhead the strident calls of a hawk. Their unusual quality attracted his attention as well as the peculiarity of the actions accompanying them. Watching, he noticed the bird pass through some unusual gyrations, steady itself a moment and then come pitching to the earth, tumbling and turning. The man ran rapidly to the spot where the hawk fell and was just in time to see a brown weasel leap from the feathers and disappear in a near-by fence. From some concealed position it had doubtless leaped upon the feeding hawk and being lighter was instantly borne high into the air. In bull-dog fashion once having a grip it continued to work deeper and deeper until a fatal spot was reached.

one, and was off like a flash. I remained quiet and she soon returned to my knee, worked slowly along my leg and up my coat till she reached the pocket, pulled out another little one, and dashed away with it. As I was not willing to give up the others, I did not experiment further. I took them home, but the folks objected so to the odor that I was obliged to kill them. I have several times seen weasels very bold, but nothing to equal this experience."

Mr. E. T. Seton⁷ cites an instance of an old weasel (*noveboracensis*) accompanied by five young ones about half-grown on June 28 near his home in Connecticut. These were evidently older than the other ones, which were still in the nest. On

⁷Seton, E. T., *Life Hist. of Northern Animals*, Vol. II, p. 848, 1909.

June 1, 1910, north-east of Guelph, Ont., I saw a weasel carrying a young one in its mouth as it followed along the bottom of a fence leading from a strip of woods. This individual may have been *M. cicognanii*.

SHORT-TAILED WEASEL, *Mustela cicognanii* (Bonaparte).

The Short-tailed or Bonaparte's Weasel is the most abundant species in Canada. Its numbers like other mammals of course are very variable as regards locality. Under favorable conditions *M. cicognanii* usually claims first notice throughout its range; the latter, including that of its closely allied races, covers almost the entire Dominion from coast to coast. Its range in the United States is governed by the boreal conditions existing in the Canadian and Upper Transition zones.

The summer color above is much like *M. longicauda*, a warm brown; under parts white, but sometimes tinged with sulphur-yellow. In winter the fur is pure white with a slight xanthic diffusion on tail, rump and hind legs. This stain is thought to exude to some extent from the odorous glands situated at the base of the tail. The latter is one-third its total length, and the black tip one-third the length of the tail.

Measurements of *M. cicognanii*: Total length about $11\frac{1}{2}$ inches (292 mm.); tail vertebrae, $3\frac{3}{4}$ inches (95 mm.); hind foot, $1\frac{1}{2}$ inches (38 mm.)

The female is considerably smaller, probably as much as one-fifth.

With the exception of the narrow belt of the Upper Austral zone above Lake Erie, this species ranges over the entire province of Ontario. It is common in the counties of Wellington and Waterloo. In a recent letter, Mr. Saunders informs me that he had no record of this species from London or the western part of the peninsula, but has skins from Durham and Ottawa, and a record by Hobson from Woodstock.

Winter is the time when this weasel is most in evidence. The dainty paired tracks may be seen in the snow about fences, log heaps, wind-falls, etc., representing vividly the wanderings of the night. In this the weasel is absolutely tireless, and withal, a very eager hunter. The white fur renders it almost invisible; except for the black tip on the tail it might bound by unseen.

The ermine trail may easily be distinguished from that of all other animals by its size in conjunction with the symmetry of its paired tracks. The mink trail is similar, but very much larger. The hind feet register almost, if not exactly in the front-foot impressions, with the right front and hind feet lagging slightly behind. The sequence of tracks with a bounding animal is not as regular between in-

dividual impressions as that of a running or walking animal, due to the variation in the length of jumps from time to time. The ermine being a bounding animal leaves a wide range of space lengths between imprints. The distance normally is about 19 inches, representing a regular rate of travel. The "jumps," however, depend entirely upon the mood, purpose or demands of the traveller. Sometimes they are no further apart than 6 or 8 inches; obviously the ermine is slowing down for more acute observation, scents prey or some similar reason. In traversing open spaces they resort to long, graceful leaps upwards of six feet in length. On January 5, 1919, I measured a record for *M. cicognanii*, a remarkable jump of 8 feet, 2 inches. The larger species should naturally be able to exceed this, but whether they do or not I am unable to say.

For pure audacity, I have seen enough of this species to prompt his classification as a ring-leader. Weasel reputation is, however, I think, very largely exaggerated. In rural sections the animal is seldom discussed apart from the hen-roost, for it seems firmly impressed upon the population that every weasel, big and little, here or there, now or any-time, is by right, might and heritage a blood soaked villain of endless carnage. But then some reasoning would dispel that view. Unfortunately for the whole lot the evil of one jeopardizes all. Individual temperament in animals is probably quite as diversified as in human beings, wherewith due allowance should be made for individual exception. Weasels do stand on the aggressive, but only a few interfere with the farmer.

I remember a little incident that happened on a summer night a number of years ago. About ten o'clock an old mother hen covering a brood of chicks, near the house, began to cackle anxiously, becoming gradually more positive until in about five minutes she opened up with a whirlwind of vociferous hysterics, sufficient to arouse the soundest sleeper. I dressed hurriedly and with light invaded the troubled region, expecting to find a skunk (*Mephitis*) on a stroll with views and tastes similar to certain southern dwellers, but it was only a solitary little *M. cicognanii*. Three chicks had been killed and the remainder was under very active consideration.

At Edmonton they were very common during 1912-14. In two or three weeks each of two winters I trapped about sixty ermine over an area of not more than nine square miles. A great deal of this area escaped the trap in running the lines making it safe to discount one-third, leaving six square miles. I believe when I ceased operation that nearly as many remained free as were taken. Halving sixty for the one year and doubling for

the supposed original population we have ten ermine per square mile. I do not consider this figure in the least excessive for the wooded, northern portion of Alberta. That portion of the province, say from Edmonton to Fort Smith, would thus yield about 1,478,750 weasels. About one in every ten of this number would undoubtedly be *longicauda*; that is, one of the latter and nine *cicognanii* to the square mile.

North of Jasper Park on the Hay river during the fall of 1913 a friend and I in eight weeks' trapping for this animal, took about eighty skins. Whether these were all *M. cicognanii* or not I cannot now say. I queried this point under *longicauda*. As the territory trapped, up the valley of the Hay river, Fish creek, and other tributary streams, did not exceed thirty linear miles, one-quarter of a mile in width, we have only a total of eight square miles. Again this is ten weasels to the square mile, coinciding with the Edmonton figure, with this difference, however, that the number of the trapped animals is not doubled to indicate the probable total population. This is because over the restricted area of the valleys and the prolonged period of trapping I believe most of the weasels were taken. At Edmonton this was not the case. In the former instance, a certain influx of animals from adjacent areas may have occurred as the competitive influence was removed from the valleys, thus lowering the figure somewhat per square mile, but I do not think a weasel travels widely in a wooded country like western Alberta.

Many interesting experiences happen to a man in the woods. One day I travelled up a long dark timbered ravine that cut into the White-mud river south-east of Edmonton. At the base of a big spruce I had a "set" for ermine, which on inspection showed the bait stolen with some of it in the sprung trap. In a few minutes' hunting, another hare was secured with which to replace it. The meat being warm was no doubt exuding a tantalizing odor to furtive nostrils, for as I knelt at the trap, a faint rustle, like leaves in a light breeze attracted my attention. There was no wind, so I concluded that it was a shrew, but looking quickly, following a repetition of the sound, I saw a beautiful snow-white ermine silhouetted among the dark roots of a spruce not three feet distant. It

eyed me for a while, head held high and nose aquiver; then it disappeared. But the next moment back it came, followed by a rapid series of disappearances and reappearances. I then laid the rabbit near the roots and the intrepid little rascal ran out, bit into the meat and retreated. After doing this for a while he would pertly mount the rabbit's carcass with his front feet, draw one foot up under his breast as if it were cold and gaze me straight in the face. Ambition was now chasing away all discretion. His next move was to bite into the rabbit's ear and attempt its removal to the hole. The brave attempts following this consuming desire were indeed very commendable.

A year later near a mountain pass in Alberta a similar experience befell me, while I was setting a lynx snare. This time the ermine after watching me with beady eyes for a time, actually followed (though with caution) a piece of meat that I slowly pulled along the ground. It was not because of food scarcity that prompted this, for hares existed in plenty throughout the region that autumn.

Another time on Fish lake, in the same general region, I broke through the ice one early afternoon and to prevent frostbite was compelled to camp and dry out my clothes. Comfort was about restored as I sat dreamily gazing into the leaping camp-fire when something flashed just to one side of my line of sight and was gone. Looking, expecting to see a whisky-jack, as usual, I saw nothing, the silent wilderness apparently, excepting myself, without an atom of life. About to dismiss the matter as a trick of the sight, I saw an ermine bounding along among the trees, hesitating momentarily, but ever circling nearer, until on the very edge of the camp almost, he stood partly erect, daintily folding one foot along his breast and surveyed the scene for several seconds. He circled the camp a number of times, darting here and there venturing now close, then retreating, bolting under roots, into holes, and over open spaces until I suppose his curiosity was fully satisfied. Then I saw him no more. There is a strange fascination in thus sitting silently in a great solitude, fleetingly viewing a bit of its wild life, open, free, unsuspecting, though usually occult and mysterious.

AN UNRECOGNIZED SUBSPECIES OF *MELANERPES ERYTHROCEPHALUS*.

BY HARRY C. OBERHOLSER.

There is in the west central United States and adjacent portion of Canada an unrecognized subspecies of *Melanerpes erythrocephalus*. Mr. Ridgway, years ago, called attention¹ to the difference in size and color between specimens of this species from the eastern United States and those from the region of the Great Plains and the Rocky Mountains, but made no subspecific separation on account of the more or less intermediate character of the birds from the Mississippi valley. A recanvass of the matter, however, shows that the bird from the Great Plains and the Rocky Mountains is subspecifically distinct and therefore deserves recognition in nomenclature. It has an available name, however, as we shall explain, and should stand as *MELANERPES ERYTHROCEPHALUS ERYTHROPHTHALMUS*, subsp. *restit.*

Melanerpes erythrophthalmus Silloway, Bull. Fergus County Free High School, No. 1, 1903, p. 36.

Chars. subsp.—Similar to *Melanerpes erythrocephalus erythrocephalus*, but decidedly larger; abdomen more strongly tinged with yellow, and more often with red.

Measurements.—Male:² wing, 142-149.5 (average, 145.6) mm.; tail, 72.5-81 (77.1); exposed culmen, 26.5-28; tarsus, 22.5-24.5 (23.5); middle toe without claw, 17.5-19 (18.2).

Female:³ wing, 140-144 (average, 142.6) mm.; tail, 74-84.5 (78.1); exposed culmen, 27-30 (27.8); tarsus, 20.5-24 (22.2); middle toe without claw, 18-19 (18.4).

Type locality.—Lewistown, Fergus County, Montana.

Geographic distribution.—West central United States and adjacent portion of Canada. Breeds north to southern Manitoba, southern Saskatchewan, and southeastern British Columbia; west to southeastern British Columbia, central Montana, central Wyoming, and central Colorado; south to northern New Mexico, northwestern Texas, and southern Oklahoma; and east to central Oklahoma, central Nebraska and eastern North Dakota. Casual in northern Utah and southeastern Arizona.

Remarks.—Size is the best and most reliable character for distinguishing this subspecies. The following measurements of *Melanerpes erythrocephalus erythrocephalus* from the central eastern United

States will facilitate comparison with those of *Melanerpes erythrocephalus erythrophthalmus* given above:

Male:⁴ wing, 134.5-145 (average, 138.1) mm.; tail, 70.75-77 (73.2); exposed culmen, 25-29 (26.4); tarsus, 22-23.5 (22.6); middle toe without claw, 17-18 (17.4).

Female:⁵ wing 133.5-138.5 (average, 135.6) mm.; tail, 72.5-77 (74.5); exposed culmen, 25-26 (25.4); tarsus, 21-22 (21.7); middle toe without claw, 17-18 (17.4).

The color differences between these two races of the red-headed woodpecker, while of value in subspecific characterization, are not constant enough to be of much use in the identification of individual specimens. The depth of the yellow tinge on the abdomen, while appreciable in a series, is in individual specimens often the same in both forms, while a more or less evident tinge of red on the abdomen is present is only 20 of 31 adult specimens of *Melanerpes erythrocephalus erythrophthalmus*; while of 40 examples of *Melanerpes erythrocephalus erythrocephalus* from the eastern United States, 9 show more or less evidence of red. In fact, one example from Fort Meade, Florida (No. 78253, U.S. Nat. Mus.), taken in June, 1879, has as much red on the abdomen as any western bird that we have examined.

Mr. Ridgway suggested⁶ that if a Great Plains race of this species were to be separated, the Mississippi Valley bird should be treated likewise because of its similarity in color to the birds from the Great Plains and its corresponding difference from those of the eastern United States. As we have shown above, the differences in color between the eastern and the farthest western birds is scarcely constant enough to serve for their recognition in absence of any other character; furthermore, of 31 adults from the Mississippi Valley, only 17 have any red tinge on the abdomen, though practically all have a more or less strong buffy suffusion. This, in view of the fact that about one-fourth of the eastern birds have at least an indication of red on the abdomen, shows clearly that there is here no color difference by any means constant enough for the subspecific separation of the Mississippi Valley birds from those of the eastern United States, or from those of the Great Plains. As will be seen, however, they are, in this average color character of red on the abdomen, somewhat nearer *Melanerpes*

¹Bull. U.S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.

²Ten specimens, from Colorado, Wyoming, and South Dakota, measured by Mr. J. H. Riley.

³Six specimens, from Colorado, Wyoming, and Oklahoma, measured by Mr. J. H. Riley.

⁴Ten specimens, measured by Mr. J. H. Riley.

⁵Five specimens, measured by Mr. J. H. Riley.

⁶Bull. U. S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.

erythrocephalus erythrophthalmus; but since they are practically the same in size⁷ as typical *Melanerpes erythrocephalus erythrocephalus*, they are to be referred to that form.

Birds from Mount Scott, in south central Oklahoma, belong undoubtedly to the western race, as do also birds from central New Mexico, and breeding birds from the Panhandle of northwestern Texas.

Red-headed woodpeckers from Minnesota are rather large and frequently have red on the abdomen, but appear to be, as a whole, nearer the eastern form. All the specimens from Texas examined, except those from the northwestern portion, belong to the typical eastern bird.

By the segregation of the present subspecies the range of *Melanerpes erythrocephalus erythrocephalus* becomes restricted to the following area:

Eastern United States and southeastern Canada: north to New Brunswick, southern Quebec, and southern Ontario; west to Minnesota, Iowa, Missouri, Arkansas, and central Texas; south to southeastern Texas, southern Louisiana, and southern Florida; and east to the Atlantic coast of the United States and New Brunswick. Casual in Nova Scotia.

The technical name to be used for the western red-headed woodpecker involves an interesting complication. In an annotated list of the birds of Fergus County, Montana, Prof. P. M. Silloway enters this species as follows:⁸

"406. RED-HEADED WOODPECKER, *Melanerpes erythrophthalmus*.

This handsome woodpecker occurs sparingly in the wooded coulees near Lewistown, which is certainly near the western limit of its distribution. On several occasions I have seen it along Big Casino, where it breeds. On June 9, 1903, I noted the presence of the red-headed woodpecker at Cottonwood. Dr. J. A. Allen states that the red-headed woodpecker was abundant everywhere from the Missouri to the Yellowstone, far outnumbering all the other Picidae together. It is migratory in this portion of its range, making its appearance about the middle of May, and beginning to nest early in June.

Distinguishing features: Head, neck, and upper part of body crimson; middle of back across, bluish-black; other parts white; length 9-10 inches."

The name *Melanerpes erythrophthalmus* is apparently a lapsus calami for *Melanerpes erythrocephalus*, and there is no other evidence that the author intended to describe a new species or subspecies. The name *Melanerpes erythrophthalmus* does not occur

in the index, but the species is duly entered there⁹ as *Melanerpes erythrocephalus*. If no description had been given, the name *Melanerpes erythrophthalmus* could have been regarded as a nomen nudum; but it is validated by the addition of the perfectly recognizable description, for it certainly can not be called a typographical error; therefore, according to the rules of nomenclature, it must be applied to the form of red-headed woodpecker occurring in its locality, now that this is found to be different from typical *Melanerpes erythrocephalus*. Its type locality is, of course, Fergus County, Montana; furthermore, since Lewistown is the first definite place mentioned we may legitimately select this as the restricted type locality. The original description of *Melanerpes erythrocephalus*¹⁰ was based on the bird of South Carolina, so that this name is, of course, properly applicable to the eastern race.

The specimens of this newly recognized race examined are principally in the United States National Museum, including the collection of the Biological Survey, but additional examples seen are in the Museum of Comparative Zoölogy, the American Museum of Natural History, and the Field Museum of Natural History. The writer is further indebted to Mr. Charles B. Cory for data in regard to specimens in the collections under his charge. The 46 specimens of *Melanerpes erythrocephalus erythrophthalmus* examined are from the localities given in the subjoined list.

Colorado.—Denver (June 5, 1874); Bear Creek (June 7, 1873); Pueblo (July 23, 25, and 28, 1874); Fort Lyon (May 16 and 19, 1883); North Fork of South Platte River (July 12, --); Kettle Creek (August 6, --); Huntsville, August 7, --).

Kansas.—Hart's Hill, east of Fort Riley (June 13, 1856).

Montana.—Custer's Creek (August 1, 1873); near old Fort Sarpy (August 9, 1873); Big Bend of Musselshell River (August 24, 1873); Sun River (September 5, 1867); 5 miles southeast of Ekalaka (May 31, 1916); Crow Agency (August 5 and 6, 1916); Little Missouri River, 8 miles north of Capital (June 3, 1916); Pilgrim Creek, 8 miles northeast of Broadus (June 12, 1916); Darnall's Ranch, Dawson County, 30 miles south of Glasgow (June 28, 1910; July 1, 1910); Zortman (July 28, 1910).

Nebraska.—Valentine (September 8, 1891).

New Mexico.—Bear Canyon, Raton Range (September 10, 1903).

North Dakota.—Valley City (June 25, 1912);

⁹Ibid., p. 75.

⁷Cf. Ridgway, Bull. U. S. Nat. Mus., No. 50, pt. VI, 1914, p. 43.

⁸Bull. Fergus County Free High School, No. 1, 1903, p. 36.

¹⁰[Picus] *Erythrocephalus* Linnaeus, Syst. Nat., ed. 10, I, 1758, p. 113 (southern South Carolina; based on Catesby, Nat. Hist. Car., Florida, Bahama Is., I, 1743, p. 20, pl. XX.)

Medora (June 16, 1913); Cannonball (August 16, 1915).

Oklahoma.—Kiowa Agency, 17 miles southeast of Fort Cobb (April 1, 1868); Mount Scott P.O. (March 26 and 27, 1904).

South Dakota.—Custer County (July 7, 1894);

Corral Draw, Pine Ridge Indian Reservation (May 16, 1894).

Texas.—Vernon (April 30, 1894).

Wyoming.—Deer Creek (May 21, 1877); Fort Laramie (May, 1864; May, 31, 1878); Black Hills (August 3, 1856); Saratoga (June 4, 1911); Greybull (June 8, 1910).

NOTES ON SOME OF THE FISHES OF ALBERTA AND ADJACENT WATERS.

BY F. C. WHITEHOUSE, RED DEER, ALTA.

Owing to the fact that ichthyology has never apparently appealed to amateur naturalists to any great extent, the general knowledge respecting our fishes is infinitely less than that concerning our birds, mammals, flora and at least two orders of insects. This surely should not be in a country like Canada, blessed with fresh water fishes to the extent that they constitute a very important factor in the economic wealth; not to mention the sport and outdoor recreation they provide to a very large number of enthusiastic fishermen. In spite of their enthusiasm, however, I find that most sportsmen are lamentably ignorant concerning their catches, and in speaking of trout for instance, either generalize in calling everything "speckled-trout," or go to the other extreme and specify "Brook trout" or "Rainbow trout," neither of which species occurs in this section of Canada—unless of course the imported "Brook trout" of the Mountains Park be included.

While disclaiming any specialized learning in the science of ichthyology, I contribute the following notes for the purpose of correcting errors in the recorded range in the case of three well known fishes, and I hope clearing up a few mistaken ideas in the minds of some who may know even less than myself upon the subject.

The list is arranged according to the "Check List of the Fishes of the Dominion of Canada and Newfoundland," which laudable work will be hereinafter alluded to as the "Government Check List."

ACIPENSERIDÆ.

41. *Acipenser transmontanus* Richardson. White Sturgeon.

Sturgeon are but rarely captured in Alberta. Three or four years ago, however, a very fine specimen was taken in the C.P.R. dam (Bow river) at Bassano, and since the Bow and Belly rivers join to become the South Saskatchewan river, and *transmontanus* is recorded from the latter waterway, the Bassano fish must presumably be referred to that species. On the other hand *A. rubicundus* (Lake sturgeon) is also recorded from "Lake of

the Woods and Prairie Provinces" so it is clearly unsafe to jump to conclusions.

HYODONTIDÆ.

52. *Hyodon chrysopsis* Richardson. Western Goldeye.

While the Government Check List gives "Provinces of Manitoba and Saskatchewan" as the range of this fish, it is certainly common in Alberta in the Red Deer river. It was also one of the fishes recorded by Mr. Fletcher's survey party, 1916, "Peace river." I do not doubt but that it is common in both branches of the Saskatchewan river.

Goldeyes usually average rather less than one pound, but they are frequently taken up to 18 ounces. I was informed of a specimen fish taken at the junction of the Blindman river and Red Deer river two years ago, the weight given being two pounds. This fish rises nicely to artificial flies, and on a light rod puts up an excellent fight. It is an insect feeder, "whirl a gig" beetles forming an important item of its diet. Under normal water conditions Goldeyes feed all over the river, but in times of flood seek the less muddy water in the mouths of tributary rivers and creeks, when they can be taken in numbers with various baits such as worms, grasshoppers, meat, etc.

In Manitoba there is a small industry in kippering Goldeyes, and both from an economic and sporting point of view an increase rather than diminution of these fishes is desirable.

SALMONIDÆ.

67. *Coregonus williamsoni* Girard. Rocky Mountain Whitefish.

This fish occurs throughout Alberta and British Columbia in rivers and lakes, but I have no first hand knowledge concerning it. In the interesting and useful little booklet, "Classified Guide to Fish and Their Habitat in Rocky Mountains Park" by Mr. S. C. Vick, published by the Dominion Parks Branch, Department of the Interior, 1913, the author states that *C. williamsoni* "is found in almost all the park lakes and streams," and both in the text,

and below the illustration, gives the species the alternative common names of Rocky Mountain Whitefish or Grayling—which, of course, places it simultaneously in two different genera. In the Raven and Clearwater rivers, west of Red Deer, so-called "Grayling" occur, and have been taken by fishermen for years past. Whether these are really Rocky Mountain Whitefish I cannot state, but I am confident that many of the "Grayling" catches are so only in the minds of their captors.

73. *Coregonus labradoricus* Richardson. Labrador Whitefish.

Whitefish occur in Lake Wabuma, west of Edmonton, and in fact in many of the lakes of northern Alberta. If the facts are as stated in the footnote (Jordan and Everman) in the Government Check List, however, the whitefish of commerce in the prairie provinces is *labradoricus*, and not *clupeiformis* the common whitefish of the Great Lakes.

89. *Oncorhynchus kennerlyi* Suckley. Kennerly's Salmon: Little Redfish.

I have no personal knowledge concerning this species. Through the kindness of Mr. J. W. Cockle, of Kaslo, B.C., I am able to give the following data:

"This diminutive salmon is found in all the waters of the interior of British Columbia. It runs up the creeks to spawn in the fall and is taken with nets and by spearing and salted down for winter use by many of the settlers. The fish is sometimes taken in Kootenay lake when trowling for salmon and forms the main diet of both salmon and char which inhabit these waters. It runs up from the Columbia river into Christina lake and spawns there on the shallow shores at the south end of the lake; large numbers are taken there every season."

93. *Salmo clarkii* Richardson. Cut-throat Trout.

This fish is most aptly named since there is a red streak on the throat on either side. It occurs in the clear rivers of Alberta and in the mountains in streams and lakes. The Cut-throat trout rises very well to artificial flies, and is a game fighter. In bodies of water of high altitude such as Consolation lake near Lake Louisa, etc., and mountain creeks, *clarkii* does not frequently exceed one pound in weight, but at lower altitudes runs from three to four pounds.

The author of the "Classified Guide," already referred to, suggests that mature fish cannot negotiate the small mountain creeks and that inbreeding results. The lakes are not inaccessible to small fish, however, and as new blood is thus introduced I do not think inbreeding is the explanation. The temperature of the high altitude lakes is intensely cold—

42 or thereabouts—and I personally incline to the opinion that the rigors of the habitat is responsible for dwarfing—a theory supported to some extent by insect life under alpine conditions.

95. *Salmo rivularis kamloops* Jordan. Kamloops Trout.

My experience of this fish is confined to the Kootenay lake at Kaslo, B.C., where it is taken on rod and line with a large spoon. Local fishermen use about 600 feet of thin line, and run the spoon say 300 feet from the boat. The fish in its fight breaks water like an Atlantic salmon. I quote, in addition, from a recent letter from Mr. J. W. Cockle, of Kaslo:

"A native of Kootenay and Okanagan lakes; when mature, large fish of both genders are silvery with a very faint tinting of pink over the gill covers; attains a weight of over 20 pounds, but the usual size of mature fish is about 12 to 16 pounds. Nothing is known of its spawning habits, but it is usually taken about the end of May and during June at which time it is in prime silvery condition."

() *Salmo rivularis kamloops*? (By Mr. Cockle and the present author).

The fish I now refer to is the species commonly (and of course erroneously) called the "rainbow trout" by fishermen. I have taken the fish at Kaslo on a spoon up to 12 pounds, and at, or rather below, Boddington Falls, B.C., up to 3½ pounds on artificial fly. It is a very game fighter, and a beautiful fish in appearance—the sides being streaked with an iridescent sheen. Mr. Cockle, of Kaslo, B.C., has had this species under observation for years and has consequently had ample opportunity to form a mature opinion as to its distinctness from the species next above. I quote from recent correspondence:

"A large salmon indigenous to Kootenay lake, which spawns on the upper waters of the Lardo and Duncan rivers just as they emerge from Trout and Houser lakes. It spawns during May and up to the second week in June, at which time the males are nearly black: specimens spawned at the Hatchery at Gerrard last season weighed 40 pounds, but the average spawning fish are about 16 to 20 pounds. When in prime condition during November they are a bright silver color, heavier spotted with black markings than the preceding, and have a bright pink band extending from the gill covers along the sides. The back is a deep olive green in contradistinction to *S. kamloops* which is blue-black on the back. There also exist some very small varieties of this species which are to be found in mountain lakes; these attain a weight of about six ounces, but the identical with the above in habit and in also turning black when spawning. The late Dr. Starr

Jordan and other authorities could find no difference in the structure of these two varieties (i.e., *S. kamloops* and *S. kamloops* . . . ?) but from the fact that the first is in prime condition at the same time that the other is spawning and has turned black, the writer has not a doubt of their distinctness, but until it is proved by breeding, the fact that they are two species will have to remain unproven."

98. *Cristivomer namaycush* Walbaum. Great Lake Trout.

Namaycush, generally conceded to be our most valuable commercial fresh water fish, inhabits the lakes of northern Alberta, and also, supposedly, Minnewanka lake, near Banff. While closely allied to the genus *Salvelinus* (Charrs) the teeth in the palate, or more correctly the vomeral ridge, easily serve to separate from that genus. To the best of my knowledge this fish will not rise to a fly at any stage in its life—a "spoon" or bait being the lures used by sportsmen. The commercial method is netting.

In the Classified Guide, already referred to, an illustration is given of a Minnewanka "*namaycush*" but the body of the fish illustrated does not taper narrowly to the tail; the tail is not forked, and excepting for the large mouth, the figure depicts the genus *Salmo* rather than *Cristivomer* or *Salvelinus*. Of course the illustration may have been made from a faulty painting or cast, but a comparison of it with the excellent illustrations in the Government Check List, Fig. 46, 47, Plate VII, will explain why I state the Minnewanka lake fish is supposedly (?) *namaycush*.

100. *Salvelinus fontinalis* Mitchell. Speckled Trout: Brook Trout.

Disregarding the importations from Lake Nipigon to the waters of the Mountains Park, this species does not occur in western Canada. In spite of this fact, however, and as stated in the introduction to this paper, more bags of fish are designated "brook trout" or "speckled trout" by their proud captors than are named (or more probably misnamed) anything else. *Fontinalis* is unusually unhappy in the matter of its common names. If it is "speckled," so are all the other members of the family! If it inhabits "brooks," it thrives equally well, or even better, in lakes and rivers! It is not a trout but a charr. Notwithstanding everything, including the fact that the Canadian charrs otherwise will not rise to artificial flies, and are poor fighters, *fontinalis* is probably the sportiest and most popular fish in the world, and in the Nipigon river on the north shore of Lake Superior specimen fish run up to 10 pounds. Mr. Vick, in the Classified Guide, states that the imported fish in the Mountains Park have adapted

themselves and that they are doing well. It is to be hoped that they are not doing so at the expense of the Cut-throat trout.

101. *Salvelinus parkii* Suckley. Dolly Varden Trout: Bull Trout.

() *Salvelinus* ? Silver Trout: Bull Trout.

In the Classified Guide to the fish in the Rocky Mountains Park, the author, Mr. Vick, separates *parkii*, the Dolly Varden trout, from the Silver trout which he designates "of the same species," but fails to supply us with a scientific name. If there are two Bull trout—and I incline to such view myself—Mr. Vick's dilemma is my own! Personally, I separate these charr chiefly by the sheen on the scales: the Dolly Varden is golden in appearance, whilst the Silver Charr is silvery. They both have pink spots, large mouths, and bodies that taper very much toward the tail. They will take any bait from a live or artificial minnow to a mouse or garter snake: are voracious feeders, but poor fighters. I have caught them from six inches long in the headwaters of mountain creeks, to six or seven pounders in the Red Deer river, and Kootenay lake, but they run up to 12 and even 14 pounds. They put in an appearance at the mouths of creeks tributary to the Red Deer river just as the ice is going out, and owing to the fact that they are native to waters unsuitable for the more delicate *Salmos*, are a valuable and interesting fish. I quote Mr. Cockle, of Kalso, B.C.

"Besides the large variety of this fish which is indigenous to the waters of Kootenay lake and reach the weight of 10 to 15 pounds and which go up the creeks during high water during June to spawn at the headwaters of the creeks, and which return again when the first snow water comes into the creeks, there is also a small variety which is practically identical, but which seems to stay up the creeks and mountain lakes at all times. These attain a weight of one-half to two pounds, and spawn during October, but whether they are the fry of the larger fish which spawns during the summer or are distinct can only be solved by the hatchery."

I have on several occasions been told of a fish that occurs in the lake at Sicamous Junction, B.C., and locally known as the "Silver Trout." From my understanding of the matter the Sicamous fish must not be confused with the Silver (charr) trout, above discussed.

109. *Thymallus tricolor montanus* Milner. Montana Grayling.

The absolute identity of the south Alberta Grayling does not appear to be established, but the Government Check List refers it to the above species. I have personally never seen an Alberta Grayling, but the curator of the Calgary Museum

(Basement, Supreme Court Building) two or three years ago showed me plaster casts of what he regarded as Alberta Grayling in contradistinction to casts of Rocky Mountain Whitefish, *Coregonus williamsoni*. I am not questioning, therefore, that a fish of the genus *Thymallus* occurs in the province, on the other hand I feel sure (as already stated under *C. williamsoni*) that no small percentage of the catches of "Grayling" taken by fishermen are Rocky Mountain Whitefish. If *T. tricolor montanus* possesses the characteristic long dorsal fin of the Grayling group—long in the sense that the fin occupies approximately one-third of the fish's back—it should be easily distinguished from any species in the Whitefish group.

SUCKERS, MULLET, ETC.

We next come to the large group of fishes commonly known as "Suckers," including Mullet, Red Horse, etc., quite uninteresting to sportsmen, and unesteemed for the table, yet far from unworthy of study from an economic standpoint. Like many creatures of nature the "Sucker" group of fishes are not wholly bad, nor good! On the one hand they are evil, in as much as they are spawn-eaters of fish more worthy than themselves, and on the other their own myriad young provide food for the said fish of greater value. I have made no study of the local fishes of this group and therefore simply list several species which, according to the Government Check List, occur in the province:

CATOSTOMIDAE.

136. *Pantosteus jordani* Evermann. Mountain Sucker.
137. *Catostomus griseus* Girard. Gray Sucker.
138. *Catostomus commersoni* Foster. Northern Sucker.
140. *Catostomus commersoni* Lacépède. Common White Sucker.
147. *Moxostoma lesueurii* Richardson. Northern Red Horse.

MINNOWS, DACE, ETC.

The next group is closely allied to the last, and comprises a number of genera of small fishes, including minnows, dace, chub, etc. By fishermen they are esteemed as bait, and as food for larger and more valuable fishes they have their uses. Some of them at any rate are spawn-eaters—so like the Suckers they are both good and evil. I list a few that are recorded in the Government Check List as occurring in the prairie provinces:

CYPRINIDAE.

168. *Notropis jordani* Eigenmann and Eigenmann. Jordan's Shiner.
177. *Notropis hudsonius selene* Jordan. The Spawn Eater.

181. *Notropis scopifer* Eigenmann and Eigenmann. Prairie Minnow.
186. *Rhinichthys cataractae dulcis* Girard. Long-nosed Dace.
195. *Couesius dissimilis* Girard.
197. *Platygobio gracilis* Richardson. Saskatchewan Dace. (Government Check List, Flat-headed Chub).

A specimen that I forwarded in alcohol to Prof. Bensley, of the University of Toronto, was referred by him to this species. The fish is common in the Red Deer river in the vicinity of Red Deer. It inhabits the mouths of creeks and eddies along the shore, and can be taken with bait, worms, etc. It appears to be an insect feeder as I have had them rise to artificial fly. The little fish is round bodied; wide across the head between the eyes, and has an extremely long nose, with protruding upper lip or snout.

LUCIIDAE.

210. *Lucius lucius* Linnaeus. Common Pike (Western "Jack-Fish.")

The pike is probably as well known as any fish that swims, for it is widely distributed not only in North America but also in Europe, Asia, etc. It occurs all over the Province of Alberta in lakes and rivers, such as the Red Deer river, Saskatchewan river, Peace river, and away north to the delta of the Peace and Athabasca. While the pike is not regarded very highly by fishermen in North America, since, generally speaking, it is a poor fighter, although individual fish will occasionally be hooked that will put up quite a struggle, such fact depends very largely, in my opinion, upon the condition of the fish, and of the water. As a table fish it is decidedly in the second rank; at the same time it is of no small economic importance due to its wide distribution. In many districts in western Canada the pike is virtually the only fish that can be obtained to supply cheap food and change of diet for the inhabitants and to the Indians it has undoubtedly always been of very considerable value.

The name "Jack-fish," so frequently given to this fish in western Canada, is an interesting mis-nomer. In the language of old country fishermen, a "jack" is a small pike, say up to five or six pounds. The name signifies size, just as the term "parr" and "grilse" signify certain immature stages in the life of the Atlantic salmon. I suppose old country settlers, years ago, called the small pike "jack" until in the end it was mistakenly adopted as a proper name, and the Pike became a "Jack-fish" quite irrespective of its size.

I am not at all sure that there are not two species of pike in western Canada, but whether the doubt-

ful form I have in mind is *Lucius reticulatus*, the Green Pike of Eastern North America or some variety of that species I cannot say. My suspicions of two species is based on the shape of the head. The head of the Common Pike, *Lucius lucius* should, according to my views, show a protuberance or bulge over the eyes, while the other species or form has a head curving gradually from the tip of the snout to the dorsum. The latter fish is the poorer fighter.

GADIDAE.

286. *Lota maculosa* Le Sueur. Fresh-water Ling: Burbot.

The Fresh-water Ling or Burbot belongs to the Cod group of fishes, including the Cods, Sea Ling and Haddock, and it is the only member of its family inhabiting fresh water. The belly is much distended by the abnormally large liver—a characteristic of the cods.

This very interesting, though somewhat objectionable-looking fish, is common in sluggish rivers and lakes in Alberta: Sylvan lake, Red Deer river, Peace river, etc. It attains considerable size, sometimes I am told up to 40 pounds. The flesh is white, it is comparatively free from bones, and it is a clean feeder, living, so far as I can discover on small fish. In spite of these facts, however, very few ling ever find their way to the table, for most fishermen, who catch them by chance, seem frightened of them. The liver and roe were esteemed as delicacies by the voyageurs, a statement I make on the authority of the Ontario Game and Fish Committee's Report of 1892.

Under normal water conditions this fish is extremely sluggish, and will lie on the bottom immobile for hours. As eels are affected by thunderstorms to unusual activity in search of food, so the fresh water ling in times of flood and muddy water, becomes a thing of action. The mouths of creeks are full of them seeking their prey—minnows and small fry. They hunt close to the bank and right on the surface, the locality always chosen by terror-stricken minnows seeking sanctuary up the creek. The gulps of the ling, sucking their prey into their spacious maws, is an unnatural and somewhat uncanny sound. My idea of the feeding habits are as follows: The fish, a strong but slow swimmer, is incapable of catching its prey by the chase. In clear water, therefore, it lies like a log, entices the small fry by means of the artificial "worm" provided by nature as an attachment to its chin, and without movement of body sucks in the intruder. In time of flood the muddy water provides concealment and "angling" is put aside in favor of the chase as explained above.

PERCIDAE.

315. *Stizostedion vitreum* Mitchell. Pike-perch (O'd English), Pickerel (Canadian); Doré (French Canadian); Wall-eyed Pike (United States.)

While the Government Check List gives Saskatchewan as the western limit, probably most fishermen in Alberta know that this fish is common in some rivers in the province, and also in some of the lakes. The largest specimen fish taken by me (mouth Waskasoo creek, Red Deer river) weighed 8½ pounds, but some years ago at the mouth of the Blindman river, at Blackfalds, Mr. D. Gregson took a pair each of which weighed 12 pounds. In 1918, a Red Deer man caught a twelve-pounder at the mouth of the Medicine river, the weight of which I verified. The fish is not a great fighter, but fishermen esteem it because of its excellence for the table. The pickerel, when of mature age, is a shy fish and cunning. It has white eyes, like a wall-eyed horse, but excellent sight nevertheless. It will take a live or artificial minnow, a spoon, and a number of different natural baits, such as worms, frogs, mice, etc.

316. *Stizostedion canadense* C. H. Smith. The Sauger.

The name Sauger probably sounds strange, and I fancy that even to many fishermen the very existence of the fish is unknown. According to the text books it is similar to the pickerel, but seldom exceeds fifteen inches in length and has a rounder body. It has a black blotch at the base of the pectoral fins, and lacks the black blotch at the hinder part of the dorsal fin of the pickerel. The western range of this fish has not been clearly defined, and it will be interesting to determine definitely whether or not some of the small sized "pickerel" of the Red Deer river are not properly the Sauger. To date I have not been able to satisfy myself upon the point, as the position of black blotches is a very unsatisfactory characteristic upon which to separate two fish. Mr. Gregson, who has lived for many years at the mouth of the Blindman river, Blackfalds, claims that he can always tell what he calls a "Red Deer river pickerel" from the smaller fish taken between the mouth and the dam. In the former the black "perch bars" are more clearly defined. On the other hand these may simply be more mature fish, and I must leave the matter undecided.

317. *Perca flavescens* Mitchell. Yellow Perch: American Perch.

The Government Check List mentions Saskatchewan as the western limit of the perch in Canada.

As a matter of fact, however, Pine lake, south-east of Red Deer, is full of perch, averaging in weight about three to the pound. The fish also occurs in the reed-beds at Sylvan lake, the average weight being from half to three-quarters of a pound. The perch is a very fair table fish, and steps should be taken to prevent the wholesale slaughter that sometimes occur at Pine lake.

The foregoing notes include a number of species of our most interesting and valuable fresh water fish, and in concluding this paper I ask the question: Do we as a people sufficiently appreciate our heritage in fishes, and realize with the rivers and lakes of Canada at our disposal, the opportunities they

offer (a) as food, (b) as a poor man's sport. Personally I do not think so upon the *broad lines* that I have in mind, and I feel, with a view to the generations to follow, that we should bestir ourselves. It seems to me the necessary procedure to be followed groups itself under three heads:

1. Continually restocking rivers and lakes with the *best fishes native* to such rivers and lakes—thus insuring an increase and not a diminution in the supply.

2. Introducing into river and lakes the *best fishes adaptable* (but not native) to such rivers and lakes.

3. Prohibiting by legislation the pollution of rivers and lakes by untreated sewage.

NESTING OF THE CASPIAN TERN IN THE GEORGIAN BAY.

BY W. E. SAUNDERS, LONDON, ONT.

The Caspian is the largest of the three Terns which the observer has a reasonable right to expect to see on our waters. Until within a few years it was supposed that the only nesting ground of these birds in the Great Lakes was on some islands in Lake Michigan, and I was, therefore, quite surprised in June, 1909, when I found an adult specimen in the collection of Mr. Chris. Firth, at Durham. It was still more surprising to be told that this bird came from near Parry Sound where it nested on an island in that portion of the Georgian Bay.

This information had come from Adam Brown who is the lighthouse keeper at Red Rock light, five miles from the Limestone Islands on which the Caspian Tern has eventually been found to nest.

The summer following my discovery of this specimen at Durham, I had a letter from Prof. Guy Bailey, Geneseo, N.Y., inquiring where he could go for some interesting Canadian bird work, and I promptly detailed him for the hunt after the Caspian Tern which he carried out with entire success. He went to Parry Sound, made inquiry, and eventually landed on Limestone Islands, where he took photographs of the eggs and young.

I was not able to visit the locality until 1918, when on June 4, Rev. C. J. Young, Brighton, Ont., Mr. Edwin Beaupre, of Kingston, Ont., and I reached Parry Sound in the afternoon and went out with Mr. Dan Bottrill to Snug Island lighthouse, some distance past the entrance to Parry Sound bay. The next day being calm we traversed the intervening ten miles to the Limestone Islands. Caspian Terns were in evidence now and again on this journey and indeed, are tolerably familiar birds around Parry Sound harbor. When we came near

the island we began to see them in considerable numbers and mingled with them were Herring and Ring-billed Gulls. The island on which the Caspians nest is only slightly elevated above the lake level with the exception of two places where mounds rise to the height of about ten feet above the lake. The chief mound, on and around which most of the nests are found, is perhaps thirty yards across at the base. The sides have a moderate slope and are covered with grasses, but the top of the mound is nearly bare of vegetation and the rock is breaking into small scaly fragments. The other mound is similar, but smaller, and the rest of the island, the northern one, is only slightly elevated above the level of the lake and more or less thickly covered with grasses.

Bare rock showed in a great many places in large irregularly formed rectangles and in the cracks between these rock faces grew the grasses which outlined them.

The two islands are connected at low water, but we had to wade from one to the other and it took us up to our knees and the footing was none too good at that.

On the southern island we imagined the nests of Kingbirds, Yellow warblers, Song sparrows, Tree swallow, Spotted Sandpiper and probably Black Duck or American Merganser as these birds were represented there, but there were no Terns' nests on it nor any gull's except those of the Herring, of which there were thirty or forty nests placed mainly between the timber logs which had drifted up from the low shores of the island and had been left high and dry by heavy winds.

Our interest centered, of course, on the Caspian Tern, and as usual in cases of communal nestings of

water birds, we found the different species keeping pretty well to themselves. The Caspian Tern selected for itself the highest portions of the island, namely, the tops of the two knolls. Here they rested when they came in from flight, and the fact that they always seemed to prefer to rest on the highest point probably accounts for the small number of nests on that part of the knoll. There were only five nests on top of the large knoll. On the sides were more nests of the Caspian Tern, but as the lower level was approached the nests of the Ring-billed Gull began to be found, and when the level at the bottom of the slope was reached, no more Caspians were to be seen. In addition to the five nests of the Caspian found on top of the large knoll, there were ninety-three nests on the sides of it. On the smaller knoll we found fifty-seven nests, making one hundred and fifty-five with eggs in all. It is to be presumed, therefore, that this colony consists of about 350 or 400 breeding birds, as many of the sets were incomplete and some of them had probably not yet begun to lay.

The habit of Terns in general is to make a very sketchy nest, often nothing more than a mere hollow, and the nests of the Caspian on top of the knoll followed this general rule, but as one observed the nests on the sides of the knoll, he found that as he went down the side, the nests became more and more substantial, until the bottom nests were almost as elaborate as those of the Ring-billed Gulls nesting alongside, and our surmise was that the higher levels were the preferred nesting ground for all species, and that the ring-bills started to lay their eggs on these higher levels but were ousted from them by the Caspians who adopted the more substantial nests of the gulls. The Caspians which were later in beginning to lay would then steal the nests of the next highest Ring-bills. This theory would account for the increasing thickness of the walls and lining of the Caspian nests as the lower levels were approached and the fact that the Caspians and the Ring-bills were nesting within three or four feet of each other in some places, also supports the theory. At one point at the south-east side of the larger knoll there was a clump of small bushes, in and around which were five nests. Three of these were Caspians and two were Ring-bills, one of these being in the centre of the patch.

It was very interesting to have these birds so close together and to compare their voices. The notes of the Caspian are, of course, unique and no one who has ever heard them would think of confounding them with any other kind of water bird to be found in Ontario. One does not need an ear for music to accomplish the distinction. Any one who can tell the bray of a donkey from the rooster's

crow, should be able to distinguish the Caspian Tern by its notes, but the Herring Gull and the Ring-bill have long been a puzzle to me and I did not get any serious help from this visit, except that the Ring-bill did not give us any example of the cackle so often used by the Herring Gull, but the musical tones of the gulls we found indistinguishable, both of them using many different pitches and phrasings.

Considering that there was so little opportunity for concealment, the Ring-billed Gulls concealed their nests very well, placing them among the grasses which grew in the cracks between the rocks.

When the cracks were of sufficient dimensions, say five or ten inches, the concealment thereby afforded was substantial, and the Ring-billed Gulls placed their nests in these strips of grassy growth at from four or five feet to fifteen feet apart.

We found the Herring Gulls to be less companionable than the others as their nests were much farther apart, seldom being as close as fifteen feet from one another. They seemed also to have laid their eggs a little earlier as we found three or four of their nests with newly hatched young, while none of the Ring-bills or Caspian Terns had hatched a single egg. Three was the maximum set for each and two were apparently being incubated in a good many cases.

Against the 155 nests of the Caspian Tern we found only 64 nests of the Herring Gull, and 77 nests of the Ring-billed Gull, and Mr. Bottril and Mr. Brown think that the Caspians in the colony are increasing slowly.

Sometimes nesting grounds of this character are apt to be much molested by human beings, but in the present instance such is not the case.

During the nesting season, the Georgian Bay indulges in a good deal of windy weather. The approach to these islands is so bad that landing can only be managed on a day so calm that it would be exceptional. To make matters still better for the Gulls and Terns they nest in a season in which the fishermen are very busy, and there is no other class of inhabitants nearby.

One of our friends had heard that there were a few Caspian Terns nesting on an island some ten or twenty miles south where the Common Tern has a colony, but we were not able to investigate this rumor.

The migration route of this species was for a long time an unsolved puzzle. They appeared in small numbers at various points in the lower lakes and that was about all we knew of them, but from the observations of Mr. E. M. S. Dale of the McIlwraith Ornithological Club, and of our president, Mr. J. F. Calvert, it seems that after the breeding season has finished, these birds make a very leisurely

journey southward, following roughly the route of the Trent Valley canal, and from there they doubtless make longer flights to the south.

That their journeys are not confined to the immediate vicinity of water was proved by our presi-

dent one day when he was gardening with his ears open, and heard from one of his friends of the Kawartha district, a salute from the upper air, making the only record we have of the occurrence of this Tern in Middlesex county.

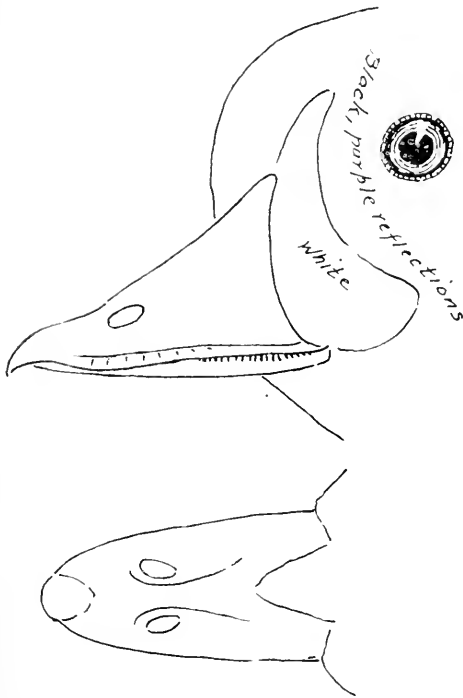
AN IMPORTANT DISTINCTION BETWEEN OUR TWO GOLDENEYES. (*Clangula clangula americana* and *Clangula islandica*.)

BY P. A. TAVERNER.

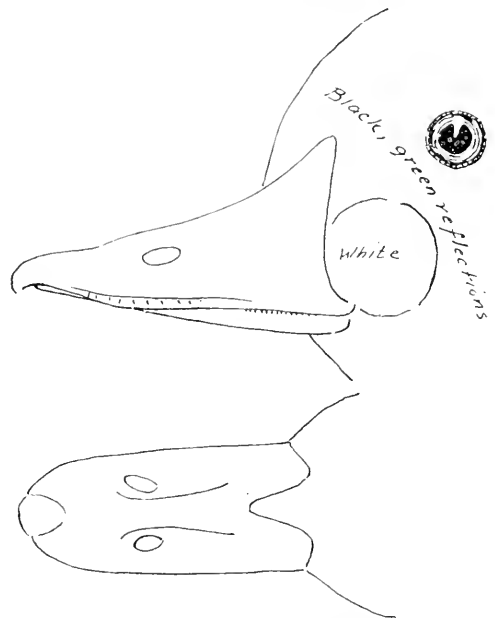
Except in adult male plumage, the resemblance between the American Goldeneye and Barrow's Goldeneye is so close as to cause considerable confusion in identification. Adult males, the American with its round facial spot against the green-black head and Barrow's with a crescentic spot of purple black are distinctive and need never be confused.

shorter, narrower and more stumpy bill than the American Goldeneye. The difference, however, is one that it is difficult to carry in mind and can only be certainly perceived when specimens are directly compared.

The male of the year is almost as difficult as the female to diagnose until traces of the adult head coloration begin to show, when the problem is immediately simplified. One distinction between these plumages has been pointed out by Major



BARROW'S GOLDENEYE.



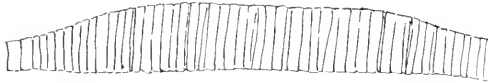
AMERICAN GOLDENEYE.

The females are so nearly alike as to be separable with difficulty. Various plumage analysis of the two species have been worked out but the one really satisfactory distinction seems to be in the size and shape of the bill which shows the only constant character for all plumages. Even in this feature the occurrence of poorly developed juveniles is a disturbing factor. Barrow's Goldeneye has a decidedly

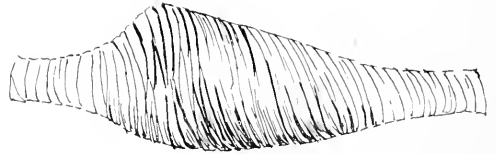
Allan Brooks and it seems reliable. A firm stroking with the finger from the base of the culmen over the crown reveals in Barrow's Goldeneye that the skull rises at the base of the bill more abruptly than in the American Goldeneye. The dissection of a number of specimens of both species, lately, however, has revealed another distinction that I cannot find hitherto recorded. The wind-

pipes of the males of the two species just before they enter the body at the merry-thought, are strikingly different. That of Barrow's Goldeneye is gradually enlarged and gradually reduced in diameter at this point. That of the American Goldeneye on the other hand is much more rapidly enlarged and then very suddenly reduced, forming a conspicuous bulbous enlargement between the arms of the clavicles. The illustrations herewith show this difference quite well. The sketches were

Goldeneye, for between these two developments the least difference would be expected. Half-fledged American Goldeneyes which I have examined show little or none of this specialization, but it is notable that complete development is reached by or before mid-winter. This specific difference does not extend to the females at any age.



WINDPIPE OF BARROW'S GOLDENEYE.
Male, adult: Perce, Gaspé Co., Que., Feb., 1916.



WINDPIPE OF AMERICAN GOLDENEYE.
Male, juv: Barkley Sound, Vancouver Island, B.C.,
Jan. 1, 1916; No. 8916.

made from dried specimens moderately stretched to show the details and are considerably longer than is normal in life. It will be noticed, also, that whilst the bony rings forming the pipe of the Barrow's Goldeneye are even and comparatively regular in shape, those of the American Goldeneye are much more irregular and confused in design.* I have purposely taken the trachea of a juvenile or yearling American Goldeneye in its first winter for comparison with the adult Barrow's

Besides offering a reliable specific test for young males this specialization of the windpipe is interesting as suggesting that Barrow's Goldeneye is the more ancient type of the two as it is obvious that the American Goldeneye's windpipe is a specialization of Barrow's Goldeneye and not vice-versa.

THE MIGRATORY BIRDS CONVENTION.

BY HARRISON F. LEWIS, QUEBEC, QUE.

The Migratory Birds Convention is such a great advance in systematic protection of North American migratory birds, and it has already proved to be so beneficial, that one hesitates to offer any criticism of it. A short experience with the workings of the convention and its enabling Act, has, however, revealed not only its strong points, but also two or three matters, of greater or lesser importance, where improvement seems to be needed.

The birds protected by the Treaty are classified therein as "migratory game birds," "migratory insectivorous birds," and "migratory non-game birds." Further details of the species included in the terms of the Treaty are given under each of the above headings, but under no heading can one find any of the large, important, and beneficial family of the Fringillidae, except grosbeaks, which are mentioned as such among the "migratory insectivorous birds."

The writer, having reported to the Dominion Parks Branch of the Department of the Interior, which is charged with the work of carrying out in Canada the provisions of the Treaty, that Snow Buntings were being sold in considerable numbers by the grocers of Quebec, was courteously informed that, after investigation, "it would seem that the Snow Bunting is not protected under the Migratory Birds Convention Act." Presumably most, if not all, of our other Sparrows and Finches would be classified with the Snow Bunting, as they, too, are mainly graminivorous.

Surely this is a grave oversight, and one which should be remedied as soon as possible, by an amending Treaty, or such other action as may be necessary. Sparrows and Finches are highly migratory, while the usefulness to man of their food habits is well known. The following remarks in this regard are quoted from E. H. Forbush's "Useful Birds and their Protection."

"Dr. Judd, in his important paper, 'The Relation of Sparrows to Agriculture,' states that the value of

*Since writing the above I find that the difference between the windpipes of the two species is noted and figured by J. Bernard Gilpin: Proc. and Trans. N. S. Inst. Nat. Sci., IV, 1875-1878, 398-399. —P.A.T.

these birds to the agriculturist is greater 'than that of any other group whose economic status has thus far been investigated' . . . The great bulk of the food of Sparrows consists of seed, fruit, and insects. The native Sparrows destroy very little grain, great quantities of weed seeds and insects, and hardly any cultivated fruit; they are, therefore, almost entirely harmless. They frequent grass fields, cultivated fields, and gardens, and in some cases orchards; thus their good work is done where it is of great benefit to the farmer."

In addition to these facts, it may be noted that many of the Sparrows and Finches are excellent songsters, and a number of them are among our beautiful and brightly-colored native birds. The popular prejudice against "Sparrows" which has resulted from the harm wrought by the imported English Sparrow, or House Sparrow, should not be allowed to prevent proper protection to our useful, attractive native Sparrows. Such occurrences as the above-related sale of Snow Buntings for food show that these birds need protection, and it does not appear why it should be withheld from them while it is very properly granted to such economically neutral birds as guillemots and petrels.

Another feature of the convention which seems to be capable of improvement is the nomenclature, which one would expect to find unusually accurate and correct in such a Treaty. The "migratory game birds" are correctly designated by the scientific names of the families included, followed by the general English names commonly applied to the members of each family, as, for example, "Anatidæ or waterfowl, including brant, wild ducks, geese and swans." "Migratory insectivorous birds" is, however, stated to mean the following: "Bebolinks, catbirds, chickadees, cuckoos, flickers, flycatchers, grosbeaks, humming birds, kinglets, martins, meadowlarks, nighthawks or bull bats, nuthatches, orioles, robins, shrikes, swallows, swifts, tanagers, titmice, thrushes, vireos, warblers, waxwings, whippoorwills, woodpeckers and wrens, and all other perching

birds which feed entirely or chiefly on insects." "Migratory non-game birds" is defined by a similar list of popular English names. The undesirable inexactness and repetition in such a list are too evident to require comment, while its only system appears to be the alphabetical one. The actual working of the Treaty is hindered by such inexactness, for if, in a given region, the popular name of a bird, which it is intended to protect, is not one of those included in the above list, the people of that region will have difficulty in understanding that the Treaty applies to that bird, and the local judicial authorities may even rule that it is not protected there. "Wild geese" are protected in Quebec by the provincial law, but Canada Geese are commonly known in that province as "Outardes," and the provincial authorities have decided that they are not protected in Quebec by the law protecting "wild geese," and that they will not be protected by that law until the term "Outardes" is added to the names of the birds so protected. It seems evident that too great care cannot be exercised in naming the birds to be granted protection by the Migratory Birds Convention, or any other similar document.

There are many things in favor of naming such protected birds species by species, giving in each case the scientific name, followed by all the known popular names used in the area of protection. Such a system of naming would give accuracy and easy popular recognition, which are both highly desirable. It might result in quite a long list, but is there any objection to that? Failing such a system, should not all the birds protected by the Migratory Birds Convention be accurately and systematically named by families, at least, as are the "migratory game birds?" It is to be hoped that the efforts of all these in Canada and the United States to whom birds are of value will be joined together to secure the amendments necessary to enable the convention to perform to the best advantage all the work which it ought to perform.



A RATTLESNAKE, MELANO GARTER SNAKES AND OTHER REPTILES FROM POINT PELEE, ONTARIO.*

BY CLYDE L. PATCH, OTTAWA, ONT.

Point Pelee, Essex County, Ont.—the most southern point in Canada—is about six miles wide at the base and, pointing southward, extends nine miles out into Lake Erie, ending in a sand bar. A shore line map of the point somewhat resembles an outline drawing of a funnel.

The human population is comprised of about a dozen families, fifty per cent of whom devote their time to agricultural pursuits, while the other half gain a livelihood by commercial fishing. This locality might prove of archaeological interest, as Indian skeletons and pottery are from time to time uncovered by the plow or the sand-shifting winds.

Point Pelee's point and west shore are wooded, while the east shore is for miles a low-sloping sandy beach a hundred or more feet in width, crowned by a fringe of willows which separates it from several square miles of marsh. The east beach is an ideal resting ground for the Piping Plover, and a most inviting point of stop-over for migrating waders. The marsh, with its several open ponds, is a feeding ground for migrant water-fowl and on or near it many resident species nest—Black Duck, Teal, Florida Gallinule, Least Bittern, Black Tern, Long-billed Marsh Wren, etc. The waters of the marsh are inhabited by various species of fishes of which the Dogfish (*Amia*) is probably the most plentiful. An interesting sight is a swarm of black, young Dogfish in a spherical mass formation two feet in diameter, and beneath the parent lurking like a bull-dog on guard.

Owing to the geographical situation of Point Pelee, many plant and animal forms found nowhere else, or only sparingly, in other parts of Canada here thrive in profusion. A floral list would include such southern tree forms as the Chestnut, Tulip, Walnut, Paw paw, and the Mulberry, which grows to a height of twenty-five feet and bears delicious thimbleberry-like fruit. Among the lower growing forms can be listed the Spicebush, the Wafer Ash and the Prickley Pear Cactus, which grows in beds sometimes ten feet in diameter and bears beautiful lemon-yellow flowers each of which lasts only for a day.

The fauna of Point Pelee equals the flora in interest, for here the Cardinal nests, and the Yellow-breasted Chat and the Mocking Bird are found,

and the Turkey Buzzard, scavenger of the south lands is not infrequently seen soaring aloft.

Among the Red Cedars which cover about fifty per cent of the wooded land, the Damon Butterfly is sought by entomologists, and in the open places the Ajax Butterfly has been taken.

Baird's Mouse is common under the drift-wood on the beaches and until recently the Cotton-tail Rabbit was conspicuous on the evening landscape.

With life so rich and varied one might expect to find the class Reptilia well represented, and so it is.

In 1913, the writer spent the three summer months on Point Pelee as a member of a Biological field party from the Victoria Memorial Museum. During this period fifty-nine reptiles representing eight species were collected. The following list includes in addition three species not collected at this time:

1. BLUE-TAILED SKINK, *Plestiodon fasciatus*.

Common under the drift-wood on the beaches, where it deposits its eggs in the rotting wood. Among the nine specimens taken the old adult color phase (olive-brown body with coppery-red head) is represented by only one individual. The largest specimen measures six and seven-eighths inches in length.

2. HOG-NOSED SNAKE, *Heterodon contortrix*.

Common on the sandy-soiled, sparsely timbered areas. Among the six specimens taken, color phases varying from yellow with dark brown markings to almost black are represented. The largest individual measures thirty-two inches.

3. BLACK RACER SNAKE, *Coluber c. constrictor*.

This species is represented in the Museum herpetological collection by a skin taken on Point Pelee, in 1906, by Mr. P. A. Taverner. Judging by the skin, the specimen from which it was taken was about six feet in length.

4. FOX SNAKE, *Elaphe vulpina*.

Common on the beaches, where the eggs are deposited under the dead wood. Apparently several individuals sometimes place their eggs in the same site, as on one occasion three specimens and half a bushel of eggs were found under a section of log. On emission the eggs are coated with an adhesive fluid which causes them to adhere and form masses. The largest individual taken measures four feet nine inches.

5. GARTER SNAKE, *Thamnophis s. sirtalis*.

Of the serpents on Point Pelee this is the most

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abundant species. It here shows a tendency to produce melanistic individuals. Three adult melano specimens were collected and a female which was transported to the museum gave birth to two black individuals in a litter of thirty-eight. With the exception of white lower jaws and throats the adult melanoes are coal black and might pass for Pilot Snakes (*Elaphe o. obsoleta*) or for Black Racer Snakes (*Coluber c. constrictor*) were it not for the divided anal plate of the former and the smooth scales of the latter species neither of which features are characteristic of *T. sirtalis*. The young individuals are black over all. The largest melano and normal specimens measure thirty and thirty-nine inches respectively.

6. RATTLESNAKE, *Crotalus horridus*.

The only example of this species in the Museum collection was taken near the end of Point Pelee on Sept. 29, 1918, by Capt. G. Wilkinson of the life saving station. In spite of the fact that for the past fourteen years the "Point," owing to its Carolinian fauna and to its being on one of the chief bird migration routes, has been the favorite observation and collecting ground of several of the Dominion's keenest naturalists, this is the only Rattler recorded in recent years.

The capture of a young individual might indicate that there were other members of the species there

present, but as this specimen is an adult measuring fifty-six inches in length and six and one-fourth inches in girth, the probabilities are that the Rattlers at Point Pelee, like those of many other localities in southern Ontario, have been exterminated.

7. MUSH TURTLE, *Kinosternon odoratum*.

Two individuals of this species were discovered by members of our party who stepped on them while wading in the marsh. The carapace of the larger specimen measures four and one-half inches in straight length.

8. SNAPPING TURTLE, *Chelydra serpentina*.

Several examples of this species were observed but owing to the small size of our containers no specimens were preserved.

9. SPOTTED TURTLE, *Clemmys guttata*.

The carapace of the largest of the six specimens collected measures four and three-fourths inches in straight length.

10. BLANDING'S TURTLE, *Emys blandingii*.

Two small individuals of this species were collected.

11. PAINTED TURTLE, *Chrysemys m. marginata*.

This species and *C. guttata* are about equally represented in the marshes.

As the foregoing is probably not a complete list of the Reptilia of Point Pelee, additional records would be of interest.

NOTES AND OBSERVATIONS.

CANADA—HOW AN ALGONQUIN COUNTRY RECEIVED AN IROQUOIS NAME.—In the edition of Champlain's Voyages, 1604-1618, reproduced by the American Historical Society, the editor in a foot-note writes of Hochelaga: "This place was probably inhabited by Iroquois." A similar assumption is made by a writer in the last Ontario Archæological Report. In neither case is there evidence of any kind cited to support this contention and the idea seems to be merely deduced from the fact that when Cartier visited Hochelaga in 1535, he found there a flourishing settlement, while when Prevost, one of Champlain's lieutenants, reached the same locality in 1603, no trace of village or settlement remained.

Recently, however, I came across some evidence which seems to give this contention a more solid footing.

I have in my possession a copy of Zeisberger's Indian Dictionary. It is a presentation copy given to the date Mr. Lindsay Russell, by Prof. E. N. Horsford, of Harvard, at whose expense and under whose supervision the work was printed in Boston in 1887. The information contained in this book

is taken from the manuscript of David Zeisberger, a Moravian missionary who worked amongst the Indians for sixty-eight years from 1740 to 1808. The manuscript is now in Harvard College.

This work is printed in four parallel columns, English, German, Onondaga and Delaware, the latter two representing the Iroquois and Algonquin linguistic stocks respectively.

On page 103 I find English and Onondaga as follows, viz:

English	Onondaga
To inhabit	Tienageri
Inhabitants in Canada	Tiochtiage hotinageri
and on page 185	

English	Onondaga
At the fork of two streams	Tiochuhogu

Now as Hochelaga was situated at the confluence of the St. Lawrence and Ottawa rivers, and as "In Canada" doubtless meant to the Iroquois of that day "In the country north of the St. Lawrence," to one knowing the different forms which an Indian word may take, owing to the language never having been a written one, it seems a fair inference that Hochelaga and Tioch-

tiage were in intent the same word, and probably derived from Tiochuhogu.

The word Tiochtiage may have been to some extent local in its use, but it was evidently current with the Eastern Iroquois amongst whom Zeisberger labored, and they it was who occupied Hochelaga if any of the Iroquois did.

If we accept the foregoing as evidence that the people of Hochelaga were Iroquois, we can readily understand how Cartier obtained the name Canada there—it being an Iroquois word meaning “a settlement or village”—and so gave an Iroquois name to a country almost all of whose natives were Algonquin.

Furthermore, this does away with the assumption that the Iroquois were at any time to any extent settled along the lower St. Lawrence river or the Gulf, a state of affairs that is highly improbable owing to the lack of their place names in that region.

Champlain evidently took the name Canada from the tradition and history of Cartier's voyage, for on his map dated 1613, while he names the country as a whole “New France,” he marks its most easterly section “Canadas,” and in his journal he names the inhabitants of that section the Canadian Indians, although they, being probably Abenakis and so of Algonquin stock, would not know what the name meant.

ARMON BURWASH.

AN ONTARIO BIRD SANCTUARY.—It is regrettable that the penetration of our wild lands by the settler and their development for agricultural purposes should involve the destruction of the haunts and breeding places of the creatures that contribute most to the beauty and charm of the countryside, and are the most assiduous protectors of the crops which are the primary cause of their disturbance. And yet it is one of the facts which bird lovers have to face. What can we do to counteract this unavoidable result of the extension of our country's most important industry? How can we help to check this retreat; how can we help to retain in our settled lands some of those sights that greet us under conditions so feelingly described by Duncan Campbell Scott:

“When you steal upon a land that man has not
sullied by his intrusion,

When the aboriginal shy dwellers in the broad
solitudes

Are asleep in their innumerable dens and night
haunts

Amid the dry ferns, with tender nests

Pressed into shape by the breasts of the mother
birds?”

An answer to these questions is given by Miss Edith L. Marsh in a welcome little book, “Birds of Peasemarsch.”*

Of the several means by which we may check the disappearance of so many of our native birds in settled districts the creation of bird sanctuaries constitutes one of the most effectual. Such sanctuaries have been established by governments and organizations, but in Canada the maintenance of private bird sanctuaries has not as yet made very great progress. For this reason Miss Marsh's description of her work and the many species of birds that are taking advantage of her efforts on their behalf forms a most valuable contribution to our Canadian literature for the promotion of wild life conservation.

It is written in a most readable and popular style and the educational value of the book makes it especially welcome. It should be in the hands of all who wish to keep the birds around them, and who does not?

Where the Indian river flows into the Georgian Bay beneath the beautiful Blue Mountain there is a tract of land which from the earliest days has been a favorite haunt of many species of land and water birds. Fortunately, it is in the hands of those who are striving to retain as many as possible of the former feathered creatures of its upland, woods and marsh.

In order to secure as much protection as possible under the provincial laws the Ontario Government has been prevailed upon to create Peasemarsch Farm a bird sanctuary under the Ontario Game Act. In Ontario, therefore, we have two such private sanctuaries: the Miner sanctuary in Essex county and the Peasemarsch sanctuary in Grey county.

But the mere creation by law of a sanctuary does not ensure the attainment of its objects. The protection of birds involves not only the provision of natural and artificial haunts, feeding and nesting places, but also the suppression of predatory enemies, whether they be the possessor of a .22 rifle or the four-footed or winged enemy. These needs and the methods of meeting them are described.

We hope that Miss Marsh's book will be widely read and her example followed not only in Ontario but in all other provinces. Nothing would contribute more to the conservation of our native bird life than the establishment of similar sanctuaries throughout Canada. The Dominion and Provincial Governments are making excellent progress in the establishment of wild life reserves, but incalculable good would result from the creation by private individuals of sanctuaries similar to Peasemarsch. Bird lovers owe much to Miss Marsh for her praiseworthy effort, which has our best wishes for success.

C. GORDON HEWITT.

*Birds of Peasemarsch. By E. L. Marsh. Musson Book Co., Toronto.



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ARCHÆOLOGY AS AN AID TO ZOOLOGY.*

By W. J. WINTERBERG.

INTRODUCTION.

The important bearing of palæontology on zoology has long been recognized by zoologists, but it is not so generally known that archæology also can give valuable aid to zoology. To the archæologist, however, the saving of the bones and shells of animals found in the course of his explorations of the graves, mounds, shell-heaps and village sites of prehistoric man, is important principally because it is by means of them that he learns something of the kinds of animals used for food, and what animal bones were used as material for artifacts, by prehistoric people. For a long time some archæologists did not seem to see any further use for such findings, but all now realize how important it is for them to collect all bones of animals, not only for their own purposes, but for the zoologist's also. So much of the earlier archæological exploration, too, was conducted in a prefatory manner with a view more to secure rarities than anything else. To the mere relic seeker, especially, animal bones are useless rubbish, and it is surprising that even those from whom better work could have been expected seldom collected these bones unless they showed evidence of workmanship.

In nearly every prehistoric site explored by the archæologist animal bones and shells are more or less numerous, but they are found less frequently in graves and mounds. The Roebuck prehistoric village site, near Prescott, Ontario, explored by the writer for the Geological Survey, Canada, in 1912 and 1915, yielded a large number of shells of fresh-water clams and animal bones, of which about six barrels were collected. From the Baum village site, in Ross county, Ohio, twenty barrels full of bones were sent to the museum of the Ohio Archæological and Historical Society in Columbus. One can get an idea from this of the large accumulations of shells and bones sometimes found.

The bones of nearly all the larger animals used as food are found. The presence of the smaller birds and such animals as mice, shrews, moles, and bats, which were probably not used as food at all, is most often not due to human agency, especially when the entire skeletons are present. Mere absence of the bones of a certain animal from shell or refuse heaps, however, does not necessarily mean that its flesh was excluded from the aboriginal menu. Its bones may have been so small as to disappear, or they may have been gnawed to pieces by the aboriginal dog. Some taboo prohibiting the eating of the flesh of certain species may account for the absence of the bones of other animals.

Some of the bones may owe their preservation to the fact that they were buried in refuse heaps composed mainly of wood ashes. Another factor which probably accounts for the excellent preservation of some is that most of them had been boiled with the meat on them, thus possibly eliminating nearly all the animal matter which might cause decay. A few owe their preservation to partial carbonization. The shells of fresh-water clams found in the refuse in some places are invariably fresh looking with the epidermis intact and the inside surface still retaining its pearly lustre.

One has to contend with several difficulties in determining the species of animals to which many of these bones belonged. Many of them have been reduced to indeterminate fragments, possibly in order to extract the marrow and also to make them of a size small enough to go into cooking pots. Others have been fashioned into various implements and ornaments; although as in the case of awls, enough of the original shape of the bone sometimes remains to enable one to identify the species of animal to which it belonged.

As to the probable age of the sites where these bones are found, it will perhaps be unnecessary to say that where no relics of the white man occur, they may be all the way from three hundred to five hundred and perhaps more years old. Algonkian sites in Ontario, and probably in central New York

*Besides those whose help is acknowledged in the text, grateful acknowledgments are here tendered to all others who kindly supplied me with information.

also, may antedate the Iroquoian occupation by hundreds of years, but these do not yield many animal remains.

By identifying the animal bones collected by the archaeologist the zoologist can determine the former presence of (1) animals now extinct, of which we have no historical record; (2) animals which are known to have become extinct or to have been exterminated since the arrival of Europeans on this continent; (3) animals not now living in the vicinity of the prehistoric site, but found in other and more distant parts of the country; and (4) animals still living in the area covered by the archaeological explorations. It is also possible for him to greatly extend the range of some species thus filling in gaps in distribution.

As practically all the bones owe their presence in archaeological sites to the fact that they are those of food animals it would probably be possible to get an approximate idea of the relative abundance of any of these animals in a certain region. The bones of those most relished for food would naturally preponderate and there would be a preponderance of the herbivores as compared with carnivores.

Given a sufficient number of specimens it is possible for the zoologist to learn whether there is any difference in the size of the bones or shells of recent and prehistoric animals of the same species. For example, there is a difference in size between recent oyster shells and those from shell-heaps. Oyster shells found by Mr. Harlan I. Smith in a shell-heap on Merigomish harbor, Nova Scotia, are much larger than those of oysters now living in the vicinity. Those from the heaps of Damariscotta, Maine, likewise are much larger than recent shells, being from eight to ten and some even fourteen inches long. Then, too, Dr. Edward S. Morse has found that shells of *Mya* from prehistoric shell-heaps of the coast of Maine and Massachusetts were higher in comparison with their length than recent specimens collected in the immediate vicinity of the same heaps. He also observed a change in the shell of the common beach cockle (*Lunatia*). The ancient shell-heap form from Marblehead, Mass., "has a much more elevated spire than the recent form living on the shore today, and this variation curiously enough was in accordance with what he had observed in a species of *Natica* in the Japanese shell-heaps."¹

There is a possibility, too, that the zoologist might discover among archaeological finds some bones exhibiting unknown pathological conditions of interest

to the student of animal pathology. It is of interest to note here that the shells of *Unio complanatus* Solander, one of our common fresh-water clams, found in the refuse of the Roebuck village site, seemed to be affected by the same species of parasitic fresh-water sponge (probably *Vioa*), causing exfoliation of the sides and umbonal region, as are those of the present day.

ZOOLOGICAL INTEREST OF SOME ARCHAEOLOGICAL DISCOVERIES.

The mention of a few examples will suffice to show that some other discoveries made by archaeologists are of considerable zoological interest. One of the most recent was made by the late Dr. H. Haeblerlin, of Columbia University, New York, in a cave in Porto Rico.² The bones were those of a large extinct species of rodent belonging to a new genus and species, allied to *Plagiodontia*. To this rodent Dr. J. A. Allen has given the name *Isolobodon portoricensis*.³

In shell-heaps in Maine were discovered many bones of an extinct species of large and heavily built mink (*Luticola macrodon* Prentiss), which "may have lived to historic times." Fifty-three finds of this mink were made in one shell-heap alone, one-fifth of all the animal bones found.⁴

Dr. Henry C. Mercer in his explorations of the Durham cave in Bucks county, Pennsylvania, found two vertebræ and a fragment of the lower jaw of an extinct species of peccary (*Mylohyus pennsylvanicus*). The modern peccaries are not known to have ranged any farther north than the Red river.⁵

As examples of discoveries which have extended the range of certain species, I might mention the following: In a mound in Lee county, Virginia, were found the bones of the caribou, which, on the authority of Dr. J. A. Allen, "is farther south than bones of the caribou have hitherto been found."⁶ In a shell-heap in Maine, Dr. Wyman found the bones of the elk or wapiti. This animal

¹Some Archaeological Work in Porto Rico, American Anthropologist, N.S., 1917, Vol. 19, pp. 225-226.

²An Extinct Octodont from the Island of Porto Rico, West Indies, Annals of the New York Academy of Sciences, Vol. XXVII, pp. 17-22.

³Loomis, F. B., and Young, D. B., On the Shell-heaps of Maine, The American Journal of Science (New Haven, Conn.), 1912, Vol. XXXIV, pp. 27-28. See also F. B. Loomis, New Mink from the Shell-heaps of Maine, *ibid.*, 1911, Vol. XXXI, pp. 227-229; D. W. Prentiss, Description of an Extinct Mink from the Shell-heaps of the Maine Coast, Proceedings of the U. S. National Museum (Washington, 1903), Vol. XXVI, pp. 887-888, and an article by M. Hardy on The Extinct Mink from the Shell-heaps, Forest and Stream, 1903, Vol. LXI, p. 125. Hardy thinks the animal became extinct about 1860.

⁴An exploration of Durham cave in 1893, Publications of the University of Pennsylvania, Vol. VI, p. 175.

⁵Carr, Lucien, Report of the Exploration of a Mound in Lee county, Virginia, etc., Report of the Peabody Museum, Vol. II, 1876-78, p. 80.

⁶Changes in *Mya* and *Lunatia* since the Deposition of the New England Shell-heaps, Proc. Am. Assoc. Adv. Science, 30th meeting, Cincinnati (Salem, 1882), p. 345.

then (1868) was not known to exist east of the Alleghany mountains.⁷

The discovery of bison bones in a cave on the upper Tularosa river, New Mexico, has extended the southwestern range of this mammal over one hundred miles.⁸

One of the most recent discoveries is that of some deer bones in Nova Scotia. Mr. Smith found a distal phalanx and some teeth in shell-heaps on Merigomish harbor, and I found several astragali, distal⁹ and proximal phalanges, the distal end of a humerus and teeth in a shell-heap on Mahone bay, about seventy-five miles west of Halifax. Nicholas Denys¹⁰ (circa 1653) does not mention the deer, and the first printed record of its appearance in Nova Scotia was in 1888. Even in New Brunswick it was not seen until 1818, only becoming plentiful by 1847.¹¹

Although they were plentiful in the days of early settlement, caribou seem to have been scarce around Mahone bay in prehistoric times, only a small piece of antler, doubtfully referred to this species, being found in the shell-heap there. Only a few individuals, also, are represented among the animal remains from Merigomish harbor.

Some archæological discoveries may help to settle uncertain or disputed points in zoology. For instance, I found in the prehistoric shell-heap on Mahone bay, the shells of the land snail *Helix hortensis* Müller,¹² and Dr. G. F. Matthew found some in a shell-heap at Bocabec, New Brunswick.¹³ They have also been found on an island in Penobscot bay, Maine,¹⁴ and on Martha's Vineyard.¹⁵ This snail is considered to be "unquestionably identical with the European species," and it was for a long time generally accepted by conchologists that it had been introduced from Europe. Morse, however, considered it "strange

that, while in the old country it is found near the habitations of men, in this country it occurs only upon the most uninhabitable islands."¹⁶ The shells found in the Mahone bay shell-heap, while they still retain traces of the rarely occurring rufous revolving bands, bear the same appearance of age as the other shells composing the heap. There is a possibility that these snails worked their way down into the shell-heap recently, perhaps by way of the burrows of small mammals, but if this were really so we would expect them to be almost as fresh looking as recent shells. Besides, if these snails crawled into the heap recently, why did we not find other species also? Dr. Matthew found the shells of no less than six native species of snails at various levels in the heap at Bocabec, and Morse reported nine from a heap on an island on the coast of Maine.¹⁷ It seems to me, therefore, just as probable that the snail shells from the Mahone bay shell-heap were deposited with the rest of the shells when the heap was formed as that they were intrusive. This and other testimony would tend to prove that the species was indigenous or else had found its way to America through other channels than commercial intercourse long before the arrival of Europeans on this continent.¹⁸ Possibly they came by way of the much discussed land-connection between the old and the new world.¹⁹

The occurrence in a shell-heap on an island in Casco bay, Maine, "of the little snail *Zua lubricoides*" Stimpson (now known as *Cochlicopa lubrica* Müller), is also, according to Morse, "inconsistent with the view that it is an introduced species."²⁰

It is still doubtful whether *Litorina litorea* (Linn.), or "Periwinkle," is an indigenous species or one introduced from Europe. No shells have yet been found in any of the prehistoric shell-heaps of the Atlantic coast, but if some were found deep in one of these heaps it would certainly be indisputable evidence that this species was here long before the advent of the white man. The possibility of finding this shell again suggests the necessity for careful and thorough methods of archæological

⁷Wyman, Dr. Jeffries, An Account of Some Kjoekkenmoeddings, or Shell-heaps, in Maine and Massachusetts, The American Naturalist, 1868, Vol. I, p. 572.

⁸Lyon, Marcus W., jr., Mammal Remains from Two Prehistoric Village Sites in New Mexico, Proceedings of the U. S. National Museum, 1907, Vol. XXXI, pp. 647-648.

⁹Identification confirmed by Dr. Gerrit S. Miller, of the U. S. National Museum.

¹⁰Description and Natural History of the Coasts of North America (Acadia), translated and edited by W. F. Ganong. Published by the Champlain Society (Toronto, 1908).

¹¹Chamberlain, Montagu, Mammals of New Brunswick, Bulletin Natural History Society of New Brunswick (St. John, 1884), No. III, p. 39.

¹²Identification confirmed by C. W. Johnson, Curator, Boston Society of Natural History.

¹³Discoveries at a Village of the Stone Age at Bocabec, N.B., Bulletin Nat. Hist. Soc., New Brunswick, No. III, p. 24.

¹⁴Johnson, C. W., *Helix hortensis* from a Maine Shell-heap, The Nautilus, 1914-1915, Vol. XXVIII, p. 131.

¹⁵Johnson, C. W., The Distribution of *Helix hortensis* Muller, in North America, *ibid.*, 1906, Vol. XX, p. 76.

¹⁶The Land Snails of New England, The American Naturalist, 1868, Vol. I, p. 187.

¹⁷Wyman, op. cit., p. 566. Also Proceedings of the Boston Society of Natural History, 1866-1868, Vol. XI, pp. 301-302. The presence in the lower portion of this particular heap of so many species of snails which, as Morse notes, can only exist in hardwood growths, whereas the island at the time of the exploration of the shell-heap was covered with large spruce trees, would argue a considerable antiquity for the shell-heap.

¹⁸See Johnson, op. cit., pp. 73-80. See also Dr. W. H. Dall's Land and Fresh-water Mollusks (Harriman Alaska Expedition, New York, 1905), Vol. XIII, p. 20, for its occurrence in the glacial Pleistocene of Maine.

¹⁹See Scharff, R. F., Distribution and Origin of Life in America (New York, 1912), p. 14.

²⁰Wyman, op. cit., p. 566.

exploration. It might be of interest to note, in this connection, that shells of *Litorina irrorata* Say, which species now ranges no farther north than the coast of Florida, were found in the refuse of a prehistoric rockshelter near New Haven, Connecticut.²¹ Its place in Connecticut waters is now taken by *Litorina litorca*.

While we are on the subject, I might mention a few other archæological discoveries of interest to the conchologist. The Mahone bay shell-heap, besides shells of *Mya arenaria* Linn., *Pecten Magellanicus* (Gmelin), *Venus mercenaria* Linn., *Spisula solidissima* (Dillwyn), *Spisula polynyma* (?) (Stimpson), *Mytilus edulis* Linn., *Ensis directus* (Conrad), *Lunatia heros* (Say), *Purpura lapillus* (Linn.), and *Buccinum undatum* Linn., also yielded two small shells of the oyster (*Ostrea virginica* Gmelin.) So far as I can learn very few oysters now occur in the bay. No oyster shells were found in the prehistoric shell-heap near French Village at the head of St. Margaret's bay.²² Only a single fragment was discovered in a shell-heap on Cole harbor, east of Halifax.²³ Dr. Matthew did not find any oyster shells in the heap at Bocabec,²⁴ nor were they reported by Professor Baird from the heaps at Oak bay, St. Croix river.²⁵ Oysters seem very scarce on the Atlantic coast of Nova Scotia, and according to Whiteaves only a few are found at Jeddore Head, and in Country and Lipscombe harbors, east of Halifax. The same authority does not mention their occurrence anywhere on the Bay of Fundy.²⁶

Our shell-heap evidence therefore is interesting as suggesting that the oyster also was scarce on the whole outer or Atlantic coast of the Maritime Provinces in prehistoric times. Mr. Smith found many oyster shells in the heaps on Merigomish harbor, which accords well with the present more common occurrence of the species in Northumberland straits.

On the coast of Maine there is a scarcity of oysters at the present day, but the prehistoric shell-heaps are almost entirely composed of oyster shells, some of the heaps, especially those on the Damariscotta river, reaching a depth of from six to twenty-five feet and covering many acres of ground.

THE PREHISTORIC FAUNA OF THE ST. LAWRENCE AND OTTAWA VALLEYS.

One can get a fairly good knowledge of the fauna of the St. Lawrence and Ottawa valleys in prehistoric times from a study of the animal bones recovered from the Roebuck village site. This is the largest collection of animal bones from a single site in any museum in Canada. The bones comprise those of mammals, birds, reptiles and fish, and there also are shells of several species of land snails and fresh-water shell-fish. My information is as yet not complete enough to reconstruct the entire fauna, so I will attempt to show how the mammalian fauna alone could be reconstructed by means of archæological and other evidences.

The first column in the table below indicates the animals which are known to inhabit the country surrounding the Roebuck village site. The second column shows those whose former presence is vouched for by old residents.²⁷ In the third column is indicated the species formerly and still living elsewhere in the Ottawa valley within from fifty to seventy-five miles of the site. The last column gives the species represented by bones found at the Roebuck village site.

Names of Mammals	Present known Fauna.	Former known Fauna.	Elsewhere in Ottawa valley	Prehistoric Roebuck village site.
COTTON-TAIL RABBIT, <i>Sylvilagus floridanus</i> (Allen)	X			
VARYING HARE, <i>Lepus americanus</i> Erxleben ²⁸			X	X
CANADA PORCUPINE, <i>Erethizon dorsatum</i> (Linn.)		X	X	X
JUMPING MOUSE, <i>Zapus hudsonius</i> (Zimmerman) -----	X		X	
RED-BACKED MOUSE, <i>Eutamias gapperi</i> (Vigors)			X	

²⁷I am indebted to Mr. George A. Drummond, of Roebuck, Ont., and Mr. F. P. Smith, of Brockville, for lists of mammals found in the vicinity of the site.

²⁸It is interesting to note that neither Mr. Drummond nor Mr. Smith mentions the White or Southern Varying Hare. It has been known for some time that the common Cotton-tail rabbit is continually pushing its way farther to the north, gradually displacing the hare. The hare goes with the destruction of the coniferous forests and the Cotton-tail comes in with the second-growth. (See The Geographical Distribution of the Eastern Races of the Cotton-tail, etc., by Outram Bangs, in Proc. Boston Society of Natural History, 1895, Vol. XXVI, p. 413.)

²¹MacCurdy, G. G.: The Passing of a Connecticut Rockshelter, The American Journal of Science, 1914, Vol. XXXVIII, pp. 517-518.

²²Jones, J. M., in Smithsonian Report, 1863, p. 371, and Glossip, W., On the Occurrence of the Kjoekkenmoedding on the Shores of Nova Scotia, Proceedings and Transactions of the Nova Scotian Institute of Natural Science for 1863-1866 (Halifax, 1867), Vol. I.

²³Glossip, op. cit., p. 98.

²⁴Op. cit.

²⁵Baird, Spencer F., Notes on Certain Aboriginal Shell Mounds of the Coast of New Brunswick and of New England, Proceedings of the U.S. National Museum, 1881, Vol. IV, p. 293.

²⁶Catalogue of the Marine Vertebrata of Eastern Canada (Geological Survey, Canada), Ottawa, 1901, p. 115.

Names of Mammals	Present known fauna.	Former known fauna.	Elsewhere in Ottawa valley.	Prehistoric Roebuck village site.
MEADOW MOUSE, <i>Microtus pennsylvanicus</i> (Ord) ²⁹ -----			X	X
MUSKRAT, <i>Ondatra zibethica</i> (Linn.)--	X		X	X
WHITE-FOOTED MOUSE, <i>Peromyscus leucopus</i> (Rafinesque)-----	X		X	
CANADIAN BEAVER, <i>Castor canadensis</i> Kuhl.----		X	X	X
WOODCHUCK, <i>Marmota monax</i> (Linn.)----	X		X	X
CHIPMUNK, <i>Tamias striatus</i> (Linn.)----	X		X	X
BLACK OR GRAY SQUIRREL, <i>Sciurus carolinensis</i> Gmelin--	X			
RED SQUIRREL, <i>Sciurus hudsonicus</i> (Erxleben)-----	X		X	X
FLYING SQUIRREL, <i>Glaucomys volans</i> (Linn.)--	X		X	
SHORT-TAILED SHREW, <i>Blarina brevicauda</i> (Say)--			X	
BREWER'S MOLE, <i>Parascalops breweri</i> (Bachman)-----			X	
STAR-NOSED MOLE, <i>Condylura cristata</i> (Linn.)--	X		X	
BROWN BAT, <i>Eptesicus fuscus</i> (Beauvois)	X		X	
SAY'S BAT, <i>Myotis subulatus</i> (Say)----			X	
SILVER-HAIRED BAT, <i>Lasionycteris noctivagans</i> (LeConte)-----			X	
VIRGINIA DEER, <i>Odocoileus americanus</i> (Erxleben)-----	X		X	X
WAPITI, <i>Cervus canadensis</i> (Erxleben) ³⁰ -----		X		X

²⁹The incisor teeth of this species, identified by Dr. R. M. Anderson, of the Biological Division, Geological Survey, Canada, were recovered from the faeces of some animal, probably the aboriginal dog.

³⁰Represented by a few molar teeth, a polished perforated canine, and possibly by some phalanges. Antlers were plowed up about one mile west of the site some years ago.

Names of Mammals	Present known fauna.	Former known fauna.	Elsewhere in Ottawa valley.	Prehistoric Roebuck village site.
MOOSE, <i>Alces americanus</i> Jardine ³¹ --		X		X
WOODLAND CARIBOU, <i>Rangifer caribou</i> (Gmelin) ³²		X	X	
RACCOON, <i>Procyon lotor</i> (Linn.)-----				
BLACK BEAR, <i>Ursus americanus</i> Pallas----	X			X
OTTER, <i>Lutra canadensis</i> (Schreber)		X	X	X
COMMON SKUNK, <i>Mephitis mephitis</i> (Schreber) ³³ -----	X		X	
WOLVERINE, <i>Gulo luscus</i> (Linn.) ³⁴ -----				
PINE MARTEN, <i>Martes americana</i> (Turton)				X
FISHER, <i>Martes pennanti</i> (Erxleben)		X		X
MINK, <i>Mustela vison</i> Schreber----	X			X
NEW YORK WEASEL, <i>Mustela noveboracensis</i> (Emmons)-----				
SMALL BROWN WEASEL, <i>Mustela cicognanii</i> Bonaparte-----	X		X	
RED FOX, <i>Vulpes fulva</i> (Desmarest)--	X		X	
GRAY WOLF, <i>Canis lycaon</i> Schreber-----		X		X
WILD CAT, <i>Lynx rufus</i> (Gueldenstaedti)		X		
CANADA LYNX, <i>Lynx canadensis</i> Kerr----	X		X	

³¹Represented by a few molar teeth and possibly an astragalus and several phalanges. The wide antlers are said to have been plowed up in the neighborhood of the site. Moose were killed by Gallinée and his party in Lake St. Francis, about sixty miles east of the site, in 1669.

³²Mr. Drummond was informed by an old hunter that when a boy his father would bring in deer with the horns standing "straight up from the top of the head." The description at once suggests caribou. A caribou killed at L'Original about 1859 is the nearest record of its occurrence in the Ottawa valley.

³³Although the skunk was eaten by some Indians and bones have been found on sites elsewhere, no bones were found at the Roebuck site.

³⁴The wolverine may have ranged as far south as the St. Lawrence valley, but no bones were found at the Roebuck site. Dr. W. Brodie found some bones in refuse heaps in York county, Ont., which he thought were possibly those of this animal. (See Annual Archaeological Report of the Provincial Museum, Toronto, for 1901, p. 51).

Out of the thirty-eight species of mammals which possibly once constituted the mammalian fauna of the country in the neighborhood of the Roebuck site, we now know definitely that eighteen species were represented in prehistoric times. Six out of seven of the species and one doubtful species would be known only from archaeological or historical evidences.

It will at once be apparent how important our archaeological evidence would be if we had no historical evidence of the existence of these mammals, and especially after the lapse of another fifty or a hundred years, when many, if not most of the species, still found in the neighborhood, will have disappeared.

PREHISTORIC RANGE OF THE WILD TURKEY.

I will now endeavor to show by means of certain examples how archaeological evidence can be utilized to show the prehistoric distribution of certain species of animals. I have selected the wild turkey because it seems to have been one of the most important food birds wherever it was abundant. In two Ohio sites, explored by Mr. W. C. Mills,³⁵ for example, turkey bones constituted as much as eighty per cent of all the bird bones found. Almost everywhere, too, where the bird existed, the bones have been made into various implements and ornaments, the tarsometatarsus being the favorite bone for awls or bodkins. I have admitted such artifacts as evidence of its presence, although there is a slight danger here that when such artifacts are few in number they may have been brought from elsewhere.

Of the original turkey, the *Meleagris gallopavo* of Linnæus, there are now four recognized varieties, as follows:—

Meleagris gallopavo silvestris Viellot. Wild Turkey.

Range.—Eastern United States from Nebraska, Kansas, Western Oklahoma, and eastern Texas, east to central Pennsylvania; formerly north to South Dakota, southern Ontario and southern Maine.

Meleagris gallopavo merriami Nelson. Merriam's Turkey.

Range.—Transition and Upper Sonoran zones in the mountains of southern Colorado, New Mexico, Arizona, western Texas, northern Sonora, and Chihuahua.

Meleagris gallopavo osceola Scott. Florida Turkey.

Range.—Southern Florida.

Meleagris gallopavo intermedia Sennett. Rio Grande Turkey.

Range.—Middle northern Texas south to north-eastern Coahuila, Uuevo Leon and Tamaulipas.³⁶ Third ed., Revised (New York, 1910), pp. 145-146.

As may be seen from the map these varieties are found distributed over a considerable area in North America.

In Canada its habitat was limited to the south-western part of Ontario, and it was fairly abundant in the days of pioneer settlement. Mr. C. W. Nash, Biologist of the Provincial Museum, Toronto, in a letter to the writer states that so far as he has been able to discover the range of the Wild Turkey "was confined to that part of the province south of a line drawn from the corner of Lambton county to Hamilton. It may have occasionally wandered a little north of that in some places, but not far. East of the county of Wentworth I have never heard of it." According to Macoun's Catalogue of Canadian Birds, the late Dr. Brodie said, "that many years ago (between 1840 and 1850), a well-known and reliable hunter saw a flock on the west side of Yonge street, in the township of Whitchurch, near Toronto, Ontario."³⁷ Archaeological evidence, seemingly confirmatory of the prehistoric presence of the bird in this very township, has been discovered by Dr. Brodie,³⁸ so it is altogether probable that the turkeys seen by Dr. Brodie's hunter informant were not stragglers but permanent residents of that part of York county.

It would be interesting to know just where and when the wild turkey first entered Canada, but, of course, this would necessarily be pure guess work. We know from archaeological evidence, however, that the bird was in Ontario and probably fairly abundant three, four, or perhaps even five centuries ago. Perhaps then, as when the bird was first seen by whites, adverse climatic conditions prevented the migration of the bird farther north and east. This is singular when we consider that the domesticated turkey, although mostly housed during part of our severe northern winters, seems to thrive far north of the limits reached by its wild congener.

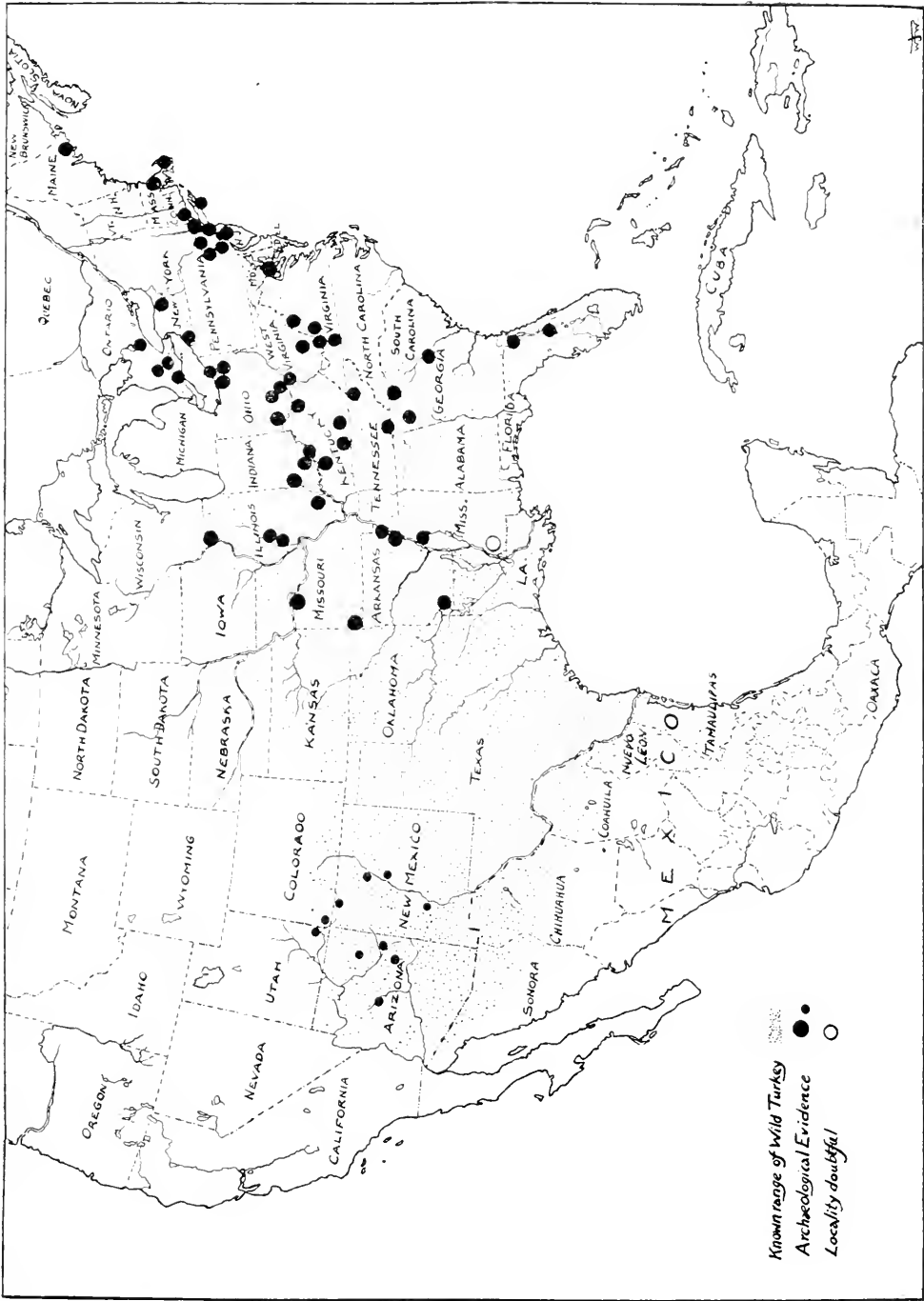
In Wisconsin the wild turkey is known to have ranged as far north as Green bay, but in all this region its bones do not appear to have been found. Perhaps the bird had spread there only a short time before the arrival of the whites. Carver (*circa* 1766-1768) saw "great plenty" of them near Lake

³⁵"Explorations of the Gartner Mound and Village Site," (Reprint from the Ohio Archaeological and Historical Quarterly, Vol. XIII, No. 2); (Columbus, 1904), p. 32; and "Explorations of the Baum Village Site (Reprint, *ibid.*, Vol. XV, No. 1), 1906, p. 31.

³⁶A. O. U. Checklist of North American Birds.

³⁷Macoun, John and James M., Catalogue of Canadian Birds (Department of Mines, Geological Survey Branch, Ottawa, 1909), p. 234.

³⁸Brodie, Dr. William, Animal Remains Found on Indian Village Sites, Annual Archaeological Report, 1901 (Ontario), p. 48.



The known range of the wild turkey and the prehistoric range as far as determined from available archaeological evidence.

Pepin, in Minnesota,³⁹ and if they were seen as early as this they may have been common enough even a century earlier. The bird was once fairly plentiful in South Dakota. The Mandans knew the turkey, but no archæological remains of the bird have so far been found on prehistoric Mandan sites.

Now, turning again to the map, it will be observed that the farthest western archæological occurrence of what was probably *M. g. silvestris* is in southwestern Missouri,⁴⁰ the farthest southern in middle Florida and the farthest northern, in central Ontario. The occurrences in New Mexico and Arizona are most probably those of semi-domesticated *M. g. merriami*; at least the dessicated bodies with well preserved feathers, found in some ruins there, have been identified as Merriam's turkey. Our knowledge of the prehistoric range of the wild turkey, however, although slightly extended in one direction, is probably very incomplete. This is due to several reasons, one being that some regions may not have been inhabited by the turkey, the faunal areas occupied by Merriam's turkey and the Rio Grande turkey, for instance, being separated by a broad belt of desert country where the bird could not possibly exist. Then, again, other regions, inhabited by the turkey, were perhaps unsuitable for human inhabitants, and, in some areas, where there were human inhabitants, the bones of the birds for some reason may not have found their way to refuse heaps and mounds, or other archæological remains. Another cause, and I think this is probably the principal one, is that in some regions archæological work, if done at all, has not been done thoroughly; in short, it was not considered worth while to collect animal bones. In many instances also the identity of the bones, which may have been collected, has never been determined, and the complete results of the exploration are therefore not known.

What interesting results could be obtained had we the necessary data! Notwithstanding the incompleteness of our map, it may yet be interesting to ornithologists as showing where the turkey did exist in prehistoric times.

The very incompleteness of the map will, nevertheless, serve to emphasize how important it is for all future archæological work to be done in a thorough, systematic manner.

PREHISTORIC RANGE OF THE GREAT AUK.

Archæological finds of bones of the Great Auk

³⁹Travels through the Interior Parts of North America, etc; Third edition, (London, 1781), p. 56.
⁴⁰C. N. Gould in his "Prehistoric Mounds in Cowley county," (Kansas), speaks of finding the bones of a gallinaceous bird, which may have been those of the turkey. (Transactions of the Kansas Academy of Science, 1895-1896 (Topeka, 1898), Vol. XV, p. 80).

(*Plautus impennis* (Linn.)), whose range on the European side of the Atlantic was from Iceland to the Bay of Biscay and on the American side from Greenland to Virginia, have helped to extend our knowledge of the former range of this bird considerably. This was interestingly shown in a map by Lucas in 1889.⁴¹ Further evidence has been discovered since this map appeared and I take the liberty of presenting one here on a larger scale giving the location of these recent additions to our knowledge. The known summer and winter ranges are as indicated on the Lucas map, but to indicate the archæological evidence I am using a symbol which stands out more distinctly than that used by him.

In Europe the Great Auk was rarely met along the coasts of Norway and Sweden, but as is evidenced by the finding of its bones in shell-heaps, it frequented the fjords of Denmark in prehistoric times. Its remains have also been found in shell-heaps in the Orkneys, in Caithness, and on Oronsay island (Argyleshire), Scotland; in old sea caves in Durham, England, and in Donegal, Antrim, Waterford and Clare, Ireland.⁴²

In America the remains of this bird have been found in shell-heaps along the North Atlantic coast. No evidence has been found of its presence in Nova Scotia, unless some bones found in the shell-heap at the head of St. Margaret's bay, and described as "evidently belonging to a bird much larger than the Great Northern Diver (*Colymbus glacialis*)"⁴³ were those of the Auk. Baird found Great Auk bones in the shell-heaps of New Brunswick.⁴⁴ In Maine the bones occurred in sufficient numbers to justify the belief that the bird was formerly very common. It was represented among the animal remains found by Wyman in the shell-heaps at Mount Desert and Crouchs cove,⁴⁵ and the shell-heaps explored by Baird, especially those on some islands in Casco bay.⁴⁶ More recently, Loomis and Young found its bones the most abundant of the bird remains in one of the shell-heaps on Flagg island, Maine.⁴⁷ In Massachusetts its remains occurred in considerable numbers at Eagle Hill, in Ipswich.⁴⁸ Wyman found its bones in a

⁴¹Lucas, Frederick A.: Animals Recently Extinct or Threatened with Extinction, etc., Report of the U.S. National Museum, 1889, p. 639.

⁴²Sharpe, R. B., A Hand-book of the Birds of Great Britain (London, 1897), Vol IV, pp. 112-113; Saunders, H., An Illustrated Manual of British Birds (London, 1899), p. 698; and Hartert, E., Jourdain, F. C. R., Ticehurst, N. F., and Witherby, H. F., A Hand-list of British Birds, etc. (London, 1912), p. 206.

⁴³Jones, J. M., in Smithsonian Report for 1863, p. 371.

⁴⁴Op. cit., p. 297.

⁴⁵Wyman, op. cit., p. 574.

⁴⁶Op. cit., p. 296.

⁴⁷Op. cit., p. 29.

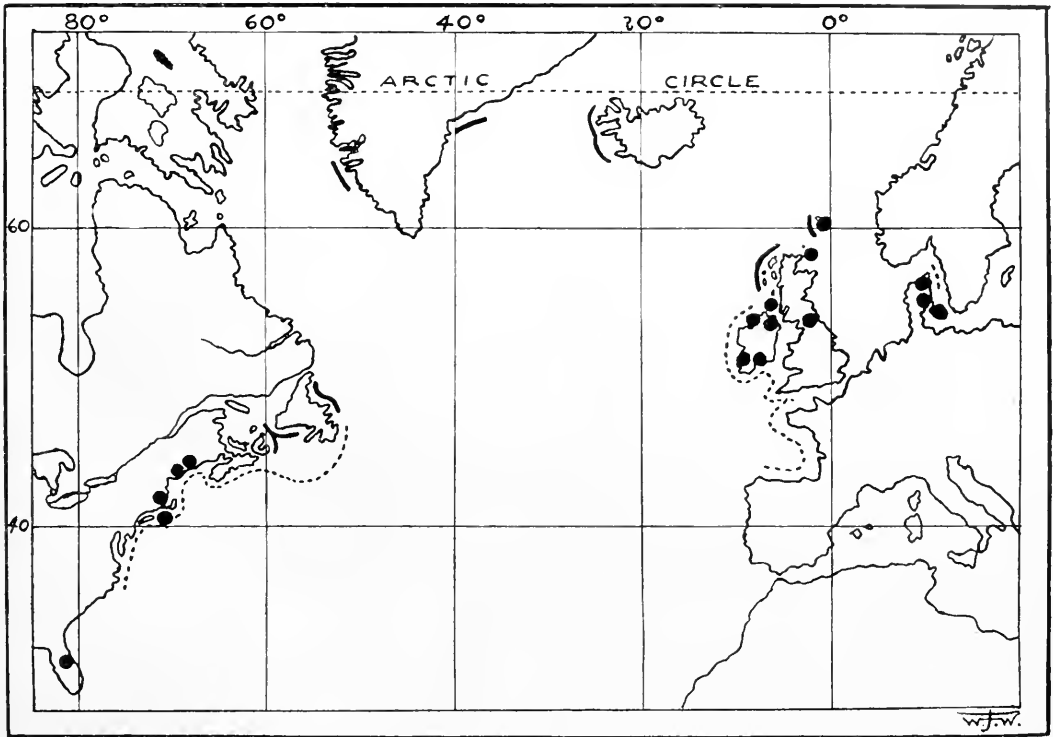
⁴⁸Baird, op. cit., p. 297.

shell-heap on Cape Cod,⁴⁹ and, according to Putnam, bones were also taken from the shell-heaps of Marblehead and Plumb island.⁵⁰

Shell-heaps on Block island, off the coast of Rhode Island, likewise yielded evidence of its presence.⁵¹

The most interesting discovery yet recorded, however, is that of two left humeri of this bird in a shell-heap at Ormond, Florida, in 1902, by W. S. Blatchley and C. H. Hitchcock, which indicates that this bird must have gone farther south than has been generally supposed, but it is very doubtful whether it was a permanent resident of Florida.⁵²

ground that the bones are probably those of birds taken during their migration southward.⁵³ Miss Hardy, on the other hand, maintains that the bones are those of summer residents and not migrants,⁵⁴ because she thinks she "can show the best of reasons for believing that nineteen-twentieths of all the clams and oysters represented by one shell-heap were taken and shelled during the summer months." Dr. Eaton, however, speaking of the Block Island shell-heaps, says, "there is no reason for supposing that they were deposited during the summer only, or even principally. On the contrary, the remains of many birds which visit our coast in the autumn



Summer Habitat of Great Auk —. Winter Range-----. Archaeological Evidence

The discovery of the bones of the Great Auk in shell-heaps has given rise to the question whether or not the bird was a summer resident of the New England coast. This has been discussed by Lucas, Miss Hardy and others. Lucas takes the

and early spring rather indicate a permanent residence of the Indians there. Furthermore, the fact that all the auk bones found belonged to mature skeletons is opposed to the theory that these birds bred on the island.⁵⁵ Forbush, considering the archaeological and historical evidence, seems in the main to agree with Miss Hardy's conclusion and thinks "we have the best of evidence that the Great Auk was found in summer at the head of Buzzard

⁴⁹Second Annual Report of the Peabody Museum (Boston, 1869), p. 17.

⁵⁰The American Naturalist (Salem, Mass., 1870), Vol. III, p. 540; Note.

⁵¹Eaton, George F.: The Prehistoric Fauna of Block Island, as Indicated by its Ancient Shell-Heaps, The American Journal of Science (New Haven, Conn., 1898), Vol. VI, pp. 143 and 147-148.

⁵²Hay, Dr. O. P.: On the Finding of the Bones of the Great Auk (*Plautus impennis*) in Florida, The Auk, 1902, Vol. XIX, pp. 255-258.

⁵³Great Auk Notes, The Auk, 1888, Vol. V, p. 232.

⁵⁴Hardy, Fanny P., Testimony of Some Early Voyagers on the Great Auk, *ibid.*, p. 384.

⁵⁵*Op. cit.*, p. 148.

Bay and the junction of the Cape Cod peninsula with the mainland."⁵⁶

CONCLUSION.

In these days when much stress is quite naturally laid on the economic value of scientific work, it is pleasing to know that archæology, aside from what many may consider its purely academic interest, is also, as I think I have succeeded in demonstrating above, of indirect value from an economic stand-

point. There is, of course, a reciprocal dependence of one science on another—archæology depending on zoology for the determination of animal remains and zoology on archæology for useful osteological material.

One of the main points to be remembered is that archæology in order to be truly scientific and most useful to other sciences, should be conducted in a thorough manner by trained, or at least competent, investigators and not by mere collectors of curios or other irresponsible parties, who destroy more useful material than they succeed in preserving.

⁵⁶Forbush, E. W., A History of the Game Birds, Wild Fowl and Shore Birds of Massachusetts and Adjacent States. (Issued by the State Board of Agriculture, 1912), p. 406.

TYPES OF CANADIAN CARICES.

BY THEO. HOLM, CLINTON, MARYLAND, U.S.A.

For nearly thirty years the writer has enjoyed the great privilege of receiving botanical collections from the Canadian Government at Ottawa. These collections, mainly brought together by Professor John Macoun, and his son, Mr. James M. Macoun, represent an immense number of Phanerogams from the Pacific to the Atlantic slope and extending far north to the Arctic regions. Although extremely rich in species of all the natural families known from Canada, these collections, nevertheless, made it evident that one genus appeared to have interested these gentlemen more particularly than most of the others. It so happened that the genus *Carex* has been, and is yet, the favorite one of the Macouns. Naturally the collectors laid special stress on the numerous species of this genus, and it is due to the great experience and skill of these gentlemen that their collections of *Carex* have been more rich in species than similar collections brought together by botanists in general.

As a matter of fact to collect Carices is a most difficult task, at least when the aim is to have the species represented at different stages, typically and less typically developed, and to show the enormous variation exhibited by many of the species. The object of the Macouns was not merely to collect specimens, but individuals in large series of developmental stages. Many new and rare species were discovered, *Carex petricosa* Dew., and *C. Franklinii* Boott, never collected since Drummond, were brought home last year by James M. Macoun in magnificent specimens. Last but not least, the geographical range has been extended year after year and it has been shown that the genus possesses many species in Canada of extremely wide distribution, not a few being circumpolar, and many ascending from the lowlands to the alpine regions

of the Rocky Mountains. And a point of special importance is that great care was taken to consider the variation of the species, which is common to many of these, when inhabiting different localities at different altitudes, and associated with certain species. In this way a broader view has been gained, and the systematist has been guided to appreciate the power of the species to adapt itself to the environment, instead of increasing the already untold number of species supposed to be specifically new, but actually being mere forms or varieties. Many instances illustrating this fact might be mentioned, but we shall confine ourselves to a few. *Carex spectabilis* Dew., was never known before except as the typical plant, described by Dewey, but James M. Macoun gathered the species in Jasper Park, Alberta, at a number of stations, and proved the species to be one of special interest with respect to variation, influenced by the environment. Such very inconspicuous species as *C. scirpoides* Wormskj., *C. nigricans* C. A. Mey., *C. pratensis* Drej., *C. gynocrates* Wormskj., *C. lejocarpa* C. A. Mey., and a host of others are now known and understood better than ever before through the painstaking studies in the field by John and James M. Macoun. Even the remote districts in Yukon, explored by John Macoun, have proved rich in Carices, of species closely allied to each other of the same alliance as a number of North European species, the *rigida*, *aquatilis* and *acutina* alliance, in Europe so excellently outlined and described by Elias Fries, Laestad, Blytt and others.

To the writer of these pages these collections have been of the same value and interest as to the Macouns, inasmuch as he for many years, has given special attention to the same genus in Europe and

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the United States. However, our knowledge of the American element of the genus we owe almost exclusively to the Macouns, through their familiarity with the genus and correct determinations. The liberal gifts of well selected material in connection with, so to speak, a most indefatigable correspondence has enabled us to draw a concise comparison of the Old World and American representations of *Carex*.

Most prevalent in the north, even beyond the Arctic Circle, and at high elevations in the mountainous districts, the genus has proved of special interest to the student of plant geography and of the migration of species during the glacial epoch, to be traced now through the circumpolar element, mingled with types of southern origin. And the vast distribution of the genus has resulted in the production of types utterly unlike each other, when comparing the supposed ancestral with those of more recent origin. The outlining of the genus in natural greges we owe to Elias Fries, Tuckerman and Salomon Drejer, who laid the foundation of demonstrating the natural affinities, instead of following the usual tendency to arrange the species in accordance with superficial characters in a mere analytical way. And, while all other Caricographers considered the "*Indicae*" distinct from "*Vigneae*" and "*Carices genuinae*" Drejer in his excellent work "*Symbolae Caricologicae*" combined these, the "*Indicae*" with the two others; thus the "*Indicae*" may be looked upon as representing evolute types of greges of both *Vigneae* and *Carices genuinae*. Furthermore Drejer demonstrated the probable affinities of the species within the greges, considering the monostachyous as "*formae hebetatae*" passing into the "*centrales*" the typical of the grex, and culminating in some more evolute with some deviating types, the so-called "*desciscentes*." By this logical arrangement the monostachyous species became transferred to various greges, instead of as formerly constituting one most unnatural section with no other feature in common than possessing a single spicate inflorescence, the pistillate, or a spike, the staminate.

Now with respect to Canadian types of the genus, it is interesting to see that of the 39 greges enumerated by the writer¹ only five are absent from Canada; these greges are as follows: *Psyllophorae* (Europe and Azores), *Chionanthae* (Europe), *Leucocephalae* (Virginia), *Echinochlaenae* (Australia), and finally *Podogynae* (Japan).

As regards the greges present the *Microrhynchae*, *Acorastachyae*, *Echinostachyae* and *Physocarpae*

are the best represented, being rich in species and of very wide distribution.

But of special interest are a number of types represented among the various greges, types of a very characteristic structure. These we will describe briefly in the same order as the respective greges (l.c. p. 453). A tristigmatic *Vigneae*, *C. nardina* Fr., by Boott named *C. Hepburnii* has been collected on mountain summits of Alberta and British Columbia. Some of the *formae hebetatae* of the *Astrostachyae*; *C. gynocrates* Wormskj. and *C. exilis* Dew., have been known as varying from monoecious to dioecious; of these the former confined to Greenland and this continent is undoubtedly most commonly monoecious in the north, judging from the specimens we have examined which were collected in Northern Labrador. British Columbia, Alaska and Greenland; in the last place we found this species probably at its most northern limit Skarvefjaeld on the island of Disco, about 69 N. lat. where it occurred only as monoecious. A still more evolute stage is represented by *C. exilis*, which in Canada occurs as monoecious or dioecious, mono—or plio—stachyous. A gynaeandrous² spike is frequently met with in this species, besides that the female plant may possess several lateral spikes, from one to six, at the base of the terminal. Among the *centrales* of this grex we find *C. stellulata* Good., *C. interior* Bail., *C. sterilis* Willd., widely distributed and clearly demonstrating a natural alliance of true species, although of very close relationship. The very peculiar and rare *C. sychnocephala* Carey of the grex *Sychnocephalae* is also a native of Canada, and only one Old World species is known of this grex, *C. cyperoides* L.; they both are very much alike, showing exactly the same habit. Among the *Xerochlaenae*, *C. macrocephala* Willd., with its dense and remarkably large inflorescence occurs on the coast and islands of Alaska, and this *Carex* is tristigmatic, although a typical member of *Vigneae*. Very peculiar is the Canadian representative of *C. teretiuscula* Good.³ with its large and frequently ramified inflorescence. Among the *Athrostachyae*, *C. festiva* is represented by a multitude of forms, and is widely distributed in the mountains; a very interesting alliance is composed of *C. pratensis* Drej., *C. pestasata* Dew.,

²The term gynaeandrous is applied to spikes with both sexes represented, the pistillate flowers being situated above the staminate; the opposite position occurs in androgynous spikes, where the staminate flowers are situated at the apex of the spike, the pistillate at the base. Formerly the term androgynous was used to signify both cases.

³It is very unjust to accept the name *C. diandra* Schrank in place of Goodenough's *C. teretiuscula*, since Schrank's material upon which he established the species was mixed, containing also *C. paradoxa* Willd. and *C. paniculata* L.

¹Greges Caricum (Studies in the Cyperaceae) American Journal of Science, Vol. XVI, 1903, p. 445.

C. adusta Boott, and *C. liddonii* Boott, besides *C. aenea* Fernald, all of which have been collected in Canada, and at a number of remote stations. Even the monotypical grex *Microcephalae* with *C. capitata* L. occurs in Yukon and Alaska, extending eastward to Alberta, Hudson Bay and Greenland.

Among the *Carices* genuinae the *Melananthae* is one of the most interesting greges; the *formae hebetatae* with their sessile spikes, and the terminal being gynæcandrous resemble certain *Vigneae* (*C. alpina* Sw.), and a corresponding distribution of the sexes occurs in several species of the *centrales*; *C. atrata* L. and its allies. In Canada *C. alpina* Sw.⁴ is known from the higher mountains; *C. atrata* L., the typical plant, has been collected at several stations by James M. Macoun, notably in the mountains of Alberta, Jasper Park, but a near ally of this, *C. ovata* Rudge (*C. atratiformis* Britton) is much more frequent especially on the Atlantic coast, nevertheless it is absent from Greenland, where it is replaced by the typical *C. atrata*. The very evolute type *C. Mertensii* Presc., in which the numerous spikes are gynæcandrous, is known from the western districts, British Columbia and Alaska. A very singular type of this grex is *C. Parryana* Dew.; it may occur as dioecious, with a single spike; which, however, seems constantly to be pistillate; or the culm is terminated by a gynæcandrous seldom purely staminate or pistillate spike, while there may also be one to four lateral spikes which are purely pistillate. *Carex Parryana* was described from specimens collected by Dr. Richardson at Hudson Bay, but has since been reported as abundant in the northern part of the prairie region, extending from Portage la Prairie to near the Athabasca river. From the mountains of Alberta, Jasper Park, James M. Macoun brought home a splendid series of *C. spectabilis* Dew., illustrating the various forms under which it appears, when inhabiting different altitudes, and stations with environment of varied nature. These interesting forms together with the typical plant have, so far, only been observed in Washington, Mt. Paddo, where they were discovered by Mr. Wilhelm Suksdorf. A species of somewhat remarkable habit is *C. microchaeta* nob., which John

Macoun collected in Yukon; in this species the culm is phyllopodic, otherwise the plant resembles somewhat *C. Tolmiei* Boott, and *C. spectabilis* Dew., but is, however, of a much more robust habit.

Passing to the *Microhynchae*, Canada is very rich in species of this grex, and several of these are of abundant occurrence; *Carex stricta* Lam., *vulgaris* Fr., *acutina* Bail., *variabilis* Bail., and *lenticularis* Michx., are perhaps the best known. Typical *C. vulgaris* Fr. is known from Alaska, British Columbia and from the eastern provinces, but the variety *lipocarpa*, nob., is much more frequent, and readily to be distinguished by the narrow leaves and the early deciduous perigynia; this variety abounds on Vancouver Island, in British Columbia and Yukon at various elevations. The variety *stolonifera* Hoppe has been collected in Labrador. Another and quite striking variety is *limnophila* nob., which resembles *C. rufina* Drej., the culm being low, curved and the spikes contiguous with the terminal occasionally gynæcandrous. It has been found on St. Paul Island, Bering Sea, and on a nunatak in Columbia glacier, Prince William's Sound; still another variety *hydrophila* nob., from Yukon is a very slender plant, with long stolons clothed with shining, purplish brown scale-like leaves, the spikes are peduncled, cylindric, dense-flowered and erect; finally the variety *strictaeformis* Bail. occurs in Nova Scotia; it is of caespitose habit, quite tall and slender with the sessile spikes remote and subtended by short bracts. In other words *C. vulgaris* shows in Canada the same ability to vary as is the case with the European plant, but, in several respects it varies in a different way. For instance the long stipitate, strongly nerved perigynium is not represented in the European plant, nor is the perigynium early deciduous as is the case with our common variety *lipocarpa*.

C. aquatilis Wahlenb., has been reported from a number of stations in Canada, and it is sometimes accompanied by some closely allied species, in Yukon by *C. sphacelata* nob., and *C. chionophila* nob.; in the Arctic regions it is replaced by *C. stans* Drej. While *Carex rigida* Good. is common in the Arctic regions, it has also been reported from some of the higher mountains in British Columbia, and the variety *Bigelovii* (Torr.) Tuckerm., is known from the Hudson Bay region. Two allies of *C. rigida*: *C. consimilis* nob., and *C. cyclocarpa* nob., are natives of Yukon; in the former the orbicular perigynium is sharply denticulate along the upper part of the margins, but the habit reminds one of *C. hyperborea* Drej.; in *C. cyclocarpa* the perigynium is turgid of a dark brownish green color

⁴The name *C. alpina* Sw. has been replaced by *C. Halleri* Gunn., in Gray's New Manual of Botany, because Schinz and Theilung have adopted this name (Bull. d'herb. Boissier, Vol. 7, 1907). However Gunner did only "pro tempore" propose this species, and without his name as author. After his death his herbarium was examined, and as stated by several Swedish authors, Gunner's material contained not only *C. alpina*, but also *C. Norvegica*, thus the name *Halleri* became invalidated. No other authors have, so far, called the species *C. Halleri*, and surely the old masters knew they had some good reason for ignoring this name.

with purplish spots above, and the caespitose habit reminds one of *C. caespitosa* L., but it lacks the aphyllopodic structure of this species.

Allied to *C. acutina* Bail. is *C. limnocharis* nob. from Yukon, a species with long, slender, pistillate spikes of reddish brown color, in habit much like the European *C. proluxa* Fr. Furthermore there are two very characteristic species bearing a strong resemblance to the European *C. acuta* L., *C. Sitchensis* Presc., known from Alaska, and *C. dives* nob., from the Chilliwack Valley and Vancouver Island, British Columbia. And, if we compare the European representations of these alliances, the *aquatilis*, *rigida* and *acuta*, we meet with analogous types corresponding with those of this continent.

The large grex *Acorastachyae* is also well exemplified in Canada, and several of the species are also well known from the northern parts of Europe, viz., *Carex subspathacea* Wormskj., *C. salina* Wahlenb., *C. cryptocarpa* C. A. Mey., *C. maritima* L., *C. Magellanica* Lam., *C. limosa* L., *C. rariflora* Sm., and *C. stygia* Fr. Of these *C. subspathacea*, *rariflora* and *stygia* extend to the Arctic regions.

But especially characteristic of this continent are *C. macrochaeta* C. A. Mey., *C. nesophila* nob., *C. aperta* Boott, *C. crinita* Lam., and *C. magnifica* Dew. A somewhat peculiar habit is exhibited by *C. nesophila*; the culm is phyllopodic and the spikes resemble those of *C. salina*, while the structure of perigynium corresponds with that of *C. macrochaeta*. This interesting species was detected by James M. Macoun on St. Paul Island, Bering Sea, and since then it has also been collected on Popoff Island by Mr. Trevor Kincaid.

Although exceedingly frequent on the Alaskan coast and the islands, *C. macrochaeta* shows but

⁵With respect to *C. Magellanica* Lam., this species has been excluded from the North American flora, and in the recently published, Gray's New Manual of Botany it has been replaced by *C. paupercula* Michx. on the strength of the diagnosis of Lamarek calling for a species with androgynous spikes, as pointed out by M. L. Fernald (Rhodora, Vol. 8, 1906, p. 73). And Mr. Fernald having examined 633 inflorescences and finding that in 600 of these the terminal spike was purely staminate, and only more or less androgynous in the remaining 33, this author reaches the remarkable conclusion that the North American species is distinct from Lamarek's, which was collected on the shores of the Straits of Magellan. The fact is, however, that Lamarek (Encyclop. 3, p. 385, n. 25) described his species "spicis androgynis," meaning that all the spikes, the terminal as well as the lateral, had staminate flowers at the base thus beneath the pistillate flowers. In *C. Magellanica* the spikes are, thus, gynaeandrous, i.e., pistillate at the top, staminate at the base and exactly this disposition of the sexes occurs in the North American and European representations of *C. Magellanica*. The main point, that the lateral spikes are constantly gynaeandrous has escaped the attention of Mr. Fernald, although Boott, Schkuhr and nearly all other caricographers have described and figured the species correctly. The fact, that the terminal spike is frequently purely staminate is of no importance.

slight variation. The terminal spike is usually wholly staminate, but we found, however, a few specimens from Unalaska in which this was either androgynous or gynaeandrous or even entirely pistillate. In the variety *emarginata* nob., the scales are prominently emarginate with a seta four times as long as the body of the scale.

In another variety *macrochaeta*, nob., the plant is very robust with four short and heavy pistillate spikes, the perigynium is very large and longer than the simply mucronate scale; it was collected on St. Paul Island, Bering Sea, by James M. Macoun. These varieties agree, however with the typical plant with respect to the culms being constantly aphyllopodic.

Among the *Cenchracarpae* we meet with the interesting little species *C. bicolor* All., reported from Alaska, Yukon and British Columbia, besides from Labrador; it occurs also in Greenland, and on the Alps in South Europe. Much more frequent is *C. aurea* Nutt., and among the desciscentes we meet with *C. granularis* Muhl., *C. pallescens* L. and the very local *C. Torreyi*, Tuckerm.

From a morphological viewpoint the *Lejochlaenae* constitute one of the most interesting grexes with their monopodial shoots and aphyllopodic culms. They are mostly sylvan types of light green color, and the more or less drooping spikes give them a very graceful aspect. Nearly all the American members are represented in Canada, and while *C. Hendersonii* Bail. is a western type the others are mainly eastern. We meet here with the *laxiflora* alliance, as well as with some desciscentes: *C. grisea* Wahlenb., *C. oligocarpa* Schk., *C. conoidea* Schk., and *C. glaucodea* Tuckerm.

The *Dactylostachyae* are much less common, and altogether poorly represented on this continent; Canada, however, is the home of the beautiful little species *C. concinna* R. Br., *C. pedunculata* Muhl. and *C. Richardsonii*, R. Br.

Some few species of the small grex *Microcarpae* are represented in Canada, viz.: *C. gracillima* Schw., and *C. formosa* Dew. Characteristic of the *Athrochlaenae* is the scales being deciduous of the perigynia being prominently stipitate and reflexed at maturity. It is a very small grex containing only two species, *C. pyrenaica* Wahlenb., and *C. nigricans* C. A. Mey. Both are found in Canada and the geographical name of the former certainly proves very unfortunate, inasmuch as the species occurs also in New Zealand. A grex closely allied to the *Athrochlaenae* is that of the *Stenocarpae* so far as concerns the structure of the perigynium, being attenuated at both ends, relatively narrow, and the generally dark colored spikes. It is a grex

of very peculiar geographic distribution since two of the *formae hebetatae*: *C. lejocarpa* C. A. Mey., and *C. circinata* C. A. Mey., are known only from Alaska and Oregon, besides some few stations on the coast of British Columbia. The *formae centrales* on the other hand, are mostly natives of the European Alps and the Himalayas, some very few occurring in Canada, viz: *C. petricosa* Dew., and *C. Franklinii* Boott., furthermore *C. Lemmonii* Boott (*C. ablata* Bail.) occurs at several stations in Canada, Washington, Montana and California. Among the *formae desciscentes* is the circumpolar *C. misandra* R. Br., which occurs in the Rocky Mountains of Colorado extending northward through the Canadian provinces.

Nearly all the American members of the *Sphaeridiophorae* have been collected in Canada, and among the *hebetatae* *C. scirpoidea* Michx., with the variety *stenochlaena* nob., is quite extensively distributed. The Greenland *C. deflexa* Hornem., occurs in Canada, but is generally confounded with *C. Rossii* Boott.; however, these two species are easily distinguished, since the culms of *C. Rossii* are aphyllopodic, those of *C. deflexa*, on the other hand, phyllopodic.

The rather large and coarse species of the *Trichocarpae* are in Canada represented by *C. riparia* Curt., var. *lucustris* Willd., *C. trichocarpa* Muhl., with the var. *aristata* (R. Br.) Bail., *C. filiformis* L., *C. lanuginosa* Michx., and the very characteristic *C. Houghtonii* Torr. These species are, however, of a very ordinary structure, but readily distinguished by the perigynium being of a brownish or dark green color, more or less turgid, pubescent and attenuated into a bidentate beak with the sharp teeth spreading.

Of greater interest is the grex *Hymenochlaenae*. Here we meet with some *formae hebetatae*: *C. Steudelii* Kunth, *C. Willdenowii* Schk., and *C. Backii* Boott, of which the flowerbearing culms are ramified in exactly the same manner as in the *Indicae*, the *Vigneastrae* of Tuckerman.⁶ The more evolute types resemble, on the other hand, *Carices genuinae* in general, but they are mostly light green, with the spikes long-peduncled and drooping. The best known are, for instance, *C. arclata* Boott, *C. debilis* Michx., *C. longirostris* Torr., *C. flexilis* Rudge, *C. capillaris* L., *C. assiniboinensis* W. Boott, and the singular, very conspicuous, *C. amplifolia* Boott. The presence of these species in Canada thus illustrate the fact of the morphological structure of the flower bearing stem being identical with that of certain members of the highly developed

Indicae, as pointed out above, in *C. Willdenowii* for instance. In passing to the *Spirostachyae*, only a few are known from this continent, and some few of these from Canada, viz: *C. Oederi*. Retz., *C. flava* L., *C. squarrosa* L., and the very rare *C. fulva* Good., the last of which being less rare in Europe.

As representing the most evolute of the greges we have the *Echinostachyae*, *Physocarpae* and *Rhynchophorae*. In these the perigynium is thin, membranaceous and inflated. In the *Echinostachyae* the pistillate spikes are peduncled, drooping and squarrose at maturity, the beak of the perigynium is quite distinct bidentate.

Two small monostachyous species: *C. microglochlin* Wahlenb., and *C. pauciflora* Lightf., represent *formae hebetatae*, and both occur in Canada. Among the *formae centrales* we meet with the very slender *C. subulata* Michx., and the much more conspicuous *C. pseudocyperus* L., *C. Schweinitzii* Dew., *C. hystericina* Muehl., and *C. rotrorsa* Schweinnitz, all well known in Canada, with the exception of *C. Schweinitzii*, which is very rare.

Characteristic of the *Physocarpae* is the perigynium having a very short, mostly emarginate beak, and the pistillate spikes not being squarrose, moreover the scale of the pistillate flower is lanceolate, acuminate, but lacks the mucro or arista of the two other greges. It is an interesting grex, and widely distributed in Canada, but several of the species are, sometimes, difficult to identify, especially those with the dark colored perigynia, for instance: *C. pulla* Good., *C. physocarpa* Presl., *C. compacta* R. Br., and *C. rotundata* Wahlenb. They are very graceful species with the shining, dark brown spikes frequently peduncled and drooping. Of a more robust habit and with the spikes of a lighter color are *C. utriculata* Boott., occurring in numberless forms throughout Canada, furthermore *C. vesicaria* L., *C. oligosperma* Michx., and a few others.

Finally the grex *Rhynchophorae* characterized by the large, erect or ascending perigynia, much inflated, strongly nerved and terminated by a prominent, bidentate beak. The species are tall, and of the same habit as those of the two former greges and like these they are inhabitants of borders of ponds, creeks and wet swamps. The grex begins with some *formae hebetatae*, *C. Michauxiana* Bæckl., and *C. folliculata* L., passing from these into *C. intumescens* Rudge, and *C. Grayii* Carey, of a similar but much more robust habit, while the more ordinary forms, such as *C. lupulina* Muehl., *C. lurida* Wahlenb., *C. Tuckermanni* Boott, and *C. monile* Tuckm., may be considered as the most

⁶Holm, Theo., Studies in the Cyperaceae, XIII *Carex Willdenowii* and its allies (Am. Jour. of Sc., Vol. X, July, 1900, p. 33).

evolute of this grex. In Canada the grex is thus well represented, and only a very few American species are absent.

Considered altogether the genus *Carex* in Canada is rich in types, some being confined to this continent, others being known also from Eurasia. The arctic element Canada shares mostly with Europe, and as stated above several species are circumpolar, and it deserves attention that many of these Canadian *Carices* represent alliances analogous to those of the old world, exemplified by types of a corresponding habit and general aspect.

So far as concerns the greges we have seen that Canada is the home of certain ancestral types, *formae hebetatae*, which are absent from Europe,

in other words several of the greges are more amply represented here by possessing these types in connection with the *centrales*, and passing gradually into some more or less deviating: *desciscentes*.

The presence in Canada of such characteristic species as those of the *Lejochlaenae*, mostly sylvan types of rare morphological structure, and of southern origin, indicates the enormously wide distribution of the genus on this continent, and its ability to adapt itself to the environment, far north and far south. And the alpine flora with its arctic species intermingled with endemic or more southern types is a tangible proof of the foundation of the theory relating to the history of the arctic flora during the glacial epoch.

HUNTING THE BARREN GROUND GRIZZLY ON THE SHORES OF THE ARCTIC.

BY H. F. J. LAMBART, OTTAWA.

One specimen of the Alaska Boundary Grizzly, *Ursus internationalis* Merriam,* a new bear of the Barren Grizzly group, was secured in July, 1912, when engaged on the survey of the 141st meridian. This was the year in which the meridian was completed through to the shores of the Arctic Ocean. Not more than two other specimens were seen by the Canadian and American parties during the summer although signs of the bear were constantly met with.

This one specimen was secured by mere chance. One of our camps was situated in a sheltered valley which later was found to be a favorite haunt as evidenced by the quantity of hair found in the gum of the small spruce against which he was accustomed to rub. This sheltered ravine was at the head of a small stream in which there was a luxuriant shrub growth, consisting of "buck brush" with some small scattered spruce, and was hemmed in by rolling high barren ridges. The elevation of the floor of the valley was about 2,000 feet above sea level and was situated just a little on the

Canadian side of the boundary and inland from the Arctic Ocean 45 miles.

The immediate district may be described as being under the lee of the British mountains, which parallel the coast at a distance of about 25 miles and reach an altitude of 6000 feet at the boundary; the mountains are deeply furrowed, the ridges being bare and open with little vegetation.

The burrows of the Arctic Ground Squirrel, *Citellus parryi* (Richardson), are sadly rooted out throughout the district casting suspicion on our friend the bear.

The floor of the river valleys are, generally speaking, heavily brushed as also the sheltered sides of the valley, and small patches of the small Arctic spruce in these localities are frequent.

I have definitely proved to my own satisfaction that the Brown and Grizzly bears prey upon the sheep (*Ovis dalli*) at the southern end of the boundary where they are found in large numbers, but here at the northern end where the sheep are very

*Alaska Boundary Grizzly. *Ursus internationalis* Merriam, Proc. Biol. Soc. Washington, xxvii, pp. 177-178, August 13, 1914.

Type locality—Alaska—Yukon Boundary, about 50 miles south of Arctic coast (lat. 69° 00' 30").

Type Specimen—No. 1763 ad., Ottawa Museum. Killed July 3, 1912, by Frederick Lambart, of Canadian Boundary Survey.

Range—Region bordering Arctic coast along international boundary, and doubtless adjacent mountains, between the coast and the Yukon—Porcupine; limits unknown.

Characters—Size medium or rather large; affinities doubtful. Color a peculiar pale yellowish brown. Head strongly arched; muzzle and frontal region broad. Large lower premolar strictly conical, without heel, as in the brown bears.

Cranial characters—Skull of medium size, massive, strongly arched and dished, highest over

anterior part of braincase; frontal shield broad, very short pointed posteriorly sulcate medially and swollen over orbits; postorbitals bluntly rounded, strongly decurved, not widely projecting; fronto-nasal region strongly dished; rostrum large and broad; sagittal crest long but feebly developed; zygomata subtriangular, not widely outstanding, and not much expanded vertically; palate and post-palatal shelf rather broad; notch moderate. Teeth rather small for size of skull; heel of last upper molar small and obliquely truncate on outer side; large lower premolar strictly of brown-bear type—a single cone without heel, sulcus, or posterior cusplets; first lower molar broad and somewhat sinuous; middle lower molar narrow and short posteriorly.

Skull measurements.—Adult male (type): Basal length, 309; occipito-nasal length, 293, palatal length, 169, zygomatic breadth, 203.5, interorbital breadth, 82.



scarce, no signs of their having been attacked or preyed upon were seen.

Around the camp at the time there were a number of cayuses from the pack trains apparently entirely ignored, although one report came in of a case where one whole train was stampeded.

The specimen referred to above was shot early in the morning in the brush of the southern slopes of the valley very near the camp, mistaken by one

at the time and the skull cleaned. The pelt was naturally not in prime condition but, however, now forms a valuable specimen in the bear collection of the Victoria Memorial Museum at Ottawa.

The color of the hair is a very light brown, darker on the back and shoulders. The head is very wide and the nose long.

The large brown bear frequenting the margins of the glaciers on the southern end of the bound-



ALASKA BOUNDARY GRIZZLY, *Ursus internationalis* Merriam.

member of the party for one of the cream colored cayuses. He was quietly strolling along unconscious of the presence of any danger and killed instantly with a .303 military cartridge at close range. The bullet having mushroomed to nearly an inch in diameter was found lodged in the outer skin, which had acted like a rubber sheet absorbing the remaining spent energy of the bullet.

I am glad to say the skin was carefully preserved

ary, as well as the little black variety, was encountered.

Some interesting experiences could be sketched of these latter, their unbounded curiosity often getting the better of their natural instincts to danger, with the result that they have been known to walk into camp during the day as well as at night and ransack everything if the camp was found to have no occupant at the time.



BIRD STUDY FROM A DUCK-BLIND.

By J. A. MUNRO, OKANAGAN LANDING, B.C.

A day's tramp in the hills usually has for an objective, a lake or slough, or a mountain-top to reach before turning homeward and after a few hours' travel, this becomes the dominant idea. One cannot sit down to watch a bird for any length of time, as the lake or slough of one's destination urges haste. One obeys the impulse and passes on, losing, it may be, a chance of learning some secret of avian psychology.

But when hidden behind a screen of brush or rushes on some pleasant lake shore, the mental attitude is that of expectancy and curiosity only. To become an inconspicuous part of the blind, that screens us from the sharp eyes of passing waterfowl, is now the object. One's predatory instincts counsel immobility and silence, so there is no impulse to move and one has the maximum of opportunity for observation. While following the flight of a bird until it is lost to view or watching with close attention, the numerous waterfowl that swim past the blind or feed within the range of binoculars, the gun is frequently forgotten. The band of scaups that swim past the blind, leaning against the breezes at an angle that reveals their white underparts and then fly straight out over the lake, until, a row of vanishing dots, they melt into the horizon, have appealed to other than the sportsman's eye. The impulse is to watch rather than shoot; the carefully built blind and the decoys swinging at their anchors to leeward have served the bird lover rather than the sportsman.

October in the Okanagan is a month of golden cloudless days and starlit nights. To-day, the 7th (1918) the lake is unruffled by the slightest breeze and on the glassy surface, there is a perfect unblurred replica of the surrounding hills. There is no frost, but the early morning air is keen and one's fingers grow numb grasping the canoe-paddle. This intimation of the cold days to come is forgotten when the first shafts of sunlight cut through the belt of firs on the mountain-top. As the sun rises higher, bathing the western hills in a flood of golden light, that creeps lower and lower until every tree stands out in relief, and as the mist-wraiths over the water are drawn up and dissipated, one can see little evidence of autumn, save the bold splashes of yellow along the shore-line where the cottonwoods are turning.

The blind is built on the edge of a narrow sandy beach, close to the mouth of a small creek that pursues its indolent course through a wide valley of farm land and brush to the north. One hun-

dred yards from the water, where the beach merges into the meadow, there is a thicket of deciduous trees, poplar, birch, alder and willow. From this shelter come the voices of a few late migrants; the faintly heard "chirp" from the last of the Audubon's Warblers and the stronger, more metallic calls from a band of Gambel Sparrows.

The lake is dotted with grebes, Western, Holboell, Horned and Pied-bills. The Horned Grebes are quite fearless; seven swim in among the decoys and alternately dive for food or preen their already immaculate plumage. Alarmed by a gun-shot, they fly, splashing along the surface for thirty or forty yards, when they alight again and huddle in a compact flock, as if for protection. In a few minutes they paddle back to rest among the decoys. Their plumage seems to be in need of constant attention; when not feeding, they are usually oiling and combing their feathers, sometimes lying on the side, one foot above the surface and bill buried in the glistening breast.

The other small species, the Pied-bill, which is much less common here, does not visit the decoys. They are more easily alarmed than the Horned Grebe, and at a sudden movement sink below the surface until only head and neck are visible, then with a rapid look to either side disappear, leaving scarcely a ripple.

The two larger species are much more wary and keep some distance out from the shore. The Western Grebe with its long slender neck and hair-like plumage, suggest reptilian ancestry more than do the other species. Paddling towards one is an interesting experience. Before being alarmed they float high on the water, conspicuously black and white; as the canoe draws near, they turn and swim straight away, showing only the black upper parts which blend with the dark water. The head is carried stiffly erect on the long straight neck and there are frequent quick glances backward. A few yards nearer and they dive with a quick clean flip. Many of these birds are suffering from a wasting disease, probably due to the presence of intestinal parasites in large numbers. The actions of the sick birds identify them at once. They swim slowly close to the shore as a rule and dive only when actively pursued, to arise exhausted within a few yards.

In the presence of their handsomer cousins the less conspicuous Holboell receive only a cursory inspection. Those that pass the blind to-day are all juveniles, with dark greyish back, spotted breast

and lacking the characteristic red neck of the adults.

The lake at noon is like a polished steel disc and a faint heat haze shimmers on the surface. Through this medium the grebe are seen as distorted shapes, suspended a foot above the water, or so it appears. Presently a faint breeze comes; the surface breaks into millions of scintillating points of light; the decoys bob up and down and make short journeys to the length of their anchor lines. The steamer ties up at the dock two miles away and the small flock of Herring Gulls that attend its daily voyage take this opportunity for a prowl along the shore, on the lookout for dead kokanees or squaw-fish. This is their daily habit. When the mid-day voyage is over they rest on the water opposite the dock until the steamer leaves in the morning then rise slowly one by one and follow with their leisurely tireless flight, keen eyes ever on the alert for the scraps that are thrown overboard from the cook's galley.

For several hours, a flock of twelve Green-winged Teal have been feeding in the shallow water, behind the thin line of rushes twenty yards out from the shore. They are very nervous, rising every few minutes and swinging out over the lake several times before pitching in again. With what marvellous speed can they check their headlong flight and drop twisting and turning down to the water! After one of their periodic flights they settle in the shallow water and from there waddle on to the beach and feed along the windrows of *Potamogeton* that drifted in during yesterday's storm. This mass of water weeds is full of the small crustaceans and insects so eagerly sought for by surface-feeding ducks and the Teal glean the abundant harvest until a passing wagon puts them to flight.

A brown Marsh Hawk, a bird of the year, flies along the beach with business-like flight, alternately flapping, or sailing on set wings. He is overtaken and routed by several hostile crows and departs in a panic, twisting and dodging across the beach until he reaches the sheltering brush where he loses his pursuers. Crows are arriving in small bands and settle on the beach close to the water's edge, some two hundred yards from the blind. These are only the forerunners of a great noisy stream, that pass in a long straggling line, some high in the air, others close to the ground. Soon the beach is black with a cawing multitude. This is the great pre-migratory caucus; only a few of these will winter in this part of the valley. Four birds arriving by themselves are attracted to a muddy stretch of beach near the blind: they swerve from the main flight and alight in the oozy mud near the water's edge where some dead kokanees have washed in. As they feast on these a passing merlin sees them and

unnoticed, stoops like an arrow. He misses or perhaps decides that the quarry is too formidable so swings in a wide circle and settles on the top of a dead poplar in the brush, while the crows fly off with squawks of alarm and join their fellows farther down the shore.

Apparently crows do not expect enemies to appear from the water as one can approach in a canoe within a few yards while the appearance of a man on foot is the signal for their hasty departure.

The lake is still again and woolly cumulus clouds gather in the south, several sweet-voiced Mountain Bluebirds alight on the beach, their backs vividly blue against the dim-colored sand. For several minutes they quietly hunt for spiders among the debris of the beach and then continue on their way, calling as they fly.

The Osprey that yearly raises a brood in the vicinity and whose fishing grounds lie off this beach is lingering at this favored spot although the two young of her brood departed a week ago. Her clear whistle is heard at a distance, but the bird is not seen. In the shallow water fifty yards from the blind stand a number of upright fir logs, once used as mooring-posts by a long-since defunct saw-mill. One of these has been used for several summers by the Osprey as a resting place and a convenient perch on which to tear up the fish that were for her own consumption.

From far out in the lake comes the single note of a Loon, mellowed and subdued by the distance. An American Merganser swims past, neck curved and head below the surface watching for the little kokanees that are running up the creek to spawn.

A straggling flock of soft-voiced Pallid Shore Larks come drifting down the beach, like a cloud of autumn leaves blown by the wind. They flutter in a circle around the blind, alight for a moment and run to the water's edge, but without bathing or drinking they are away again like a flash, for no apparent reason. On all sides they pass, with slow undulating flight, so close, that the breath of air from their wings is felt on the cheeks. Again and again they return, always rising again before the binoculars can be levelled in the hope of picking out a Longspur among them. A short half-mile to the west, rising abruptly for a thousand feet above the lake is the bare hillside where they feed; they come to the beach only for gravel and water. It is curious how all the alpine or northern breeding birds that travel in large flocks, Rosy Finches, Shore Larks, Snow Buntings and Pipits, have this restless habit of circling and wheeling before alighting, and of flying off suddenly again in nervous haste.

A month later there is a decided change in the

aspect of the surrounding hills. Much of the color has gone; the narrow wooded coulees, that were like tongues of flame against the brown grassy slopes, are now subdued in color and merge with their surroundings. The leaves have fallen, only the delicate tracery of naked branches is seen. Along the shore line, the cottonwoods are still a blaze of orange, but many of their leaves have fallen too and cover the ground with a rustling golden carpet. The higher mountains, Terrace, Goat and Silver Star, are crowned with glittering snow-caps and the close ranks of fir for some distance below the bald summits are frosted with the silver of the first snow. As yet, there is no frost in the valley, so sitting motionless in the blind entails no discomfort and bird-life is still plentiful enough to absorb all one's attention. In the brush to the north, a Western Meadowlark is whistling, his clear flute-like notes as vivid as if it were April instead of November. A flock of brown backed Juncos are flitting through the trees or alighting on the sand and in the alders a sweet-voiced crowd of Pallid Goldfinches have gathered.

From far down the beach comes the unmistakable sonorous call of a Sandhill Crane, decidedly a belated migrant. He flies slowly along the shore with splendid slow wingbeats, head carried well forward, the neck slightly curved and legs held stiffly behind. He is attended by two softly-flying Short-eared Owls, that follow a few yards to the rear. As the crane nears the blind, he becomes suspicious and bears off to the north, the owls still following. He reaches the beach again in a wide circle and once more flies towards the blind, hesitates again and after rising higher in the air flies off, first to the north and then to the west where he is lost to view against the neutral-colored background of the hills. The owls do not follow but fly back towards the grassy meadows from whence they came and as they pass the blind, the sunlight burnishes their tawny wings until they shine like gold.

Along the eastern shore line, about two hundred yards out from the beach, a great flock of Redheads have congregated over a bed of *Potamogeton* and their feeding call, a cat-like *meow* comes softly across the water. Into this large raft, small flocks are continually flying, one sees a succession of splashes on the still water as the birds hurl themselves in and are carried by the momentum of their flight for several yards along the surface. Many of the new arrivals are Scaups and these feed among the flock of Redheads, but the Canvas Backs as a rule feed only with others of their kind. A big flight of these occurred during the past few

days. It is rarely one sees more than a dozen at one time, but during this migration flocks of twenty or thirty were common and probably two or three hundred were present at one time. As they readily fly toward the half-dozen canvass-back decoys, it is plain they are new-comers.

Close to the fringe of rushes on the shallow water near shore, a band of fifteen Ring-neck Ducks alight and immediately begin to feed. They are new arrivals and hungry; frequently all are below the surface together. More than half of them are drakes and as they rise to the surface, the white barred bill and the white triangle on the chin serve as diagnostic field-marks. The strings of weed brought to the surface trailing from their bills are hurriedly gulped and they dive for another mouthful. After feeding for forty minutes, their appetites are satisfied, so they rest on the surface for ten minutes longer, dressing their feathers and then paddle in regular alignment to the deep water and safety.

A single female Scaup swims towards the decoys, calling at regular intervals with a singular unduck-like voice, *kuhcoo, kuhcoo*. The first syllable too short and explosive, the second exactly the coo of a pigeon.

Small bands of Buffle Head fly past, seldom more than two or three feet above the water. They swerve down to the Redhead flock but usually carry on a little beyond them, to the shallow water. The strikingly black and white adult drakes are in the minority. The young drake can be told from the ducks by their greater size, otherwise they are identical. When diving for food they are amazingly quick in their actions, coming to the surface with more buoyancy than other diving ducks. They are equally quick in the air, rising with a spring and without the preliminary splashing one associates with diving ducks.

Four Killdeer are heard down the beach and presently they fly past the blind conspicuous and noisy, to alight again a few yards away where they seem to disappear into the sand, so well do the neutral colored backs harmonize with the beach.

The half-dozen Herring Gulls that make a daily pilgrimage in the wake of the steamer have been joined by an equal number of the smaller California Gulls. These are fully adult birds with immaculate breasts that are visible from a long distance as the birds rest on the water. Red-shafted Flickers, Magpies, a Northern Shrike and a Kingfisher visit the beach during the day and in the evening outlined against a pastel tinted sky appears a triangle of Canada Geese, southward bound—a fitting climax to a perfect day.



BOOK NOTICES AND REVIEWS

THE GAME BIRDS OF CALIFORNIA. Contributions from the University of California, Museum of Vertebrate Zoology. By Jos. Grinnell, Harold Child Bryant and Tracy Irwin Storer. Univ. of Cal. Press, Berkeley, 1918, large 8 vo. pp. i-x plus 1-642, 16 colored plates and 94 text figures. Price, cloth, \$6.00 net.

This is one of the most notable bird books and one of the handsomest examples of popular book-making that has been published under the auspices of a public institution in some time. It is a credit to the University and Museum in whose name it appears, as well as to the printer who executed it and the artists and authors who illustrated and wrote it. It contains a greater mass of game bird life histories both original and compiled probably than any other work generally accessible. The colored illustrations consist of some of the best work from the brushes of Louis Agassiz Fuertes and our talented countryman, Major Allan Brooks. The many line drawings scattered throughout the text to illustrate critical points are exceptionally accurate, clean and clear. The introduction states that the work was undertaken to meet the varied requirements of the sportsman, the legislator and the naturalist and was made possible through the financial munificence of a patron who refuses to make his (or her) name known. California is to be congratulated on having such public-spirited citizens.

In an opening chapter dealing with the Decrease of Game and Its Causes it is definitely proved that game has decreased and an analysis is made of the contributing factors. Tables of game that have passed through the hands of dealers have been obtained directly from their own books and are presented in evidence. These numbers are ample evidence of the drain on wild life that market hunting entails. Other agencies of decrease are logically and calmly discussed giving due weight to their effects pro and con with convincing restraint.

The next chapter, on the Natural Enemies of Game Birds, discusses the effects of vermin and other enemies and incidentally corrects a number of common preconceptions of their relative values.

The Gun Club of California is a chapter all conservationists should read. Arguments are given on both sides to show that the subject is not a simple one to be answered offhand. Parallel columns giving detrimental and favorable effects are contrasted and the result summed up in the final paragraph, saying:

"It would appear that the institution of well re-

gulated gun clubs, occurring as it has, at a critical stage in the adjustment of natural to artificial conditions, is to be looked upon as a propitious rather than an adverse factor in the conservation of our duck supply. Whether or not, as further changes result from the increased human population, this valuation of the preserve will persist, remains to be seen"

The History of the Attempts to Introduce Non-native Game Birds in California, is an illuminating chapter, and deserves study by all who contemplate such introductions elsewhere.

The Propagation of Game Birds is an equally important chapter and includes a valuable bibliography on the subject.

The last chapter of the introductory part gives the history and present status of legislation relating to game birds in California.

The Key to the Game Birds of California seems an admirable instrument. It is clear and concise and notable for the absence of obscure or technical terms and is such that any one of ordinary intelligence should be able to get results with it.

The main part of the book is, of course, occupied with the detailed treatment of the various species in their systematic order. The descriptions of plumages are unusually complete and clear, paragraphs on Marks for Field Identification, Voice, Nest, Eggs, General Distribution and Distribution in California of each one are given, and all are admirably arranged, paragraphed and picked out by distinctive type for ready reference.

The discussions of the species include much original material, but also the most complete series of excerpts from other authors dealing with the life histories and other pertinent matter of the various species that can anywhere be found under one cover.

The method of such a tripartite authorship wherein each does that for which he is specially fitted is the ideal one in dealing with a broad subject wherein no one man can be an equal authority in all directions and the course is here amply justified by the results

This book should appeal especially to bird students, sportsmen and conservationists of western Canada as whilst it deals most particularly with California, the bulk of it is equally applicable to British Columbia and it forms the work that most nearly fulfills far western needs that has so far been published.

P. A. TAVERNER.

ERRATA

Page 51, Vol. XXXIII, Sept., 1919, delete word "late" in bottom line of right column.

Page 57, Vol. XXXIII, Sept., 1919, 11th line, left column, for "crescentic spot of purple," read "crescentic spot on purple."



THE CANADIAN FIELD-NATURALIST

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No. 5.

CANADIAN SPHAERIIDAE.

BY THE HON. MR. JUSTICE LATCHFORD.

There are few more fascinating objects of study in natural history than the members of the family of small bivalve mussels known as the *Sphaeriidae*. They abound in the vicinity of Ottawa, and indeed throughout the whole Nearctic region. The drainage area of the Great Lakes, and of their outlet, our own St. Lawrence, may be regarded as the metropolis of the family in North America. Yet, as Dr. Vincent Sterki recently pointed out,¹ the fauna of the Great Lakes themselves is only fragmentarily known; but, so far as known, presents many peculiar forms and possibly species. Still less are we acquainted with the fauna of the vast areas northward, extending from Newfoundland through Labrador and across Canada to the Rocky Mountains. In Prince Edward Island, Mr. C. Ives, of Miscouche, has collected a few species. In the vicinity of Ottawa, in Ontario and Quebec, considerable work was done many years ago by the members of the Ottawa Field-Naturalists' Club, especially by Gilbert Heron, Dr. Fletcher, the Rev. Geo. W. Taylor, and the writer. Officers of the Geological and Natural History Survey, notably Mr. W. McInnes, gathered some material in the waters flowing into Hudson Bay. Little, however, is known of the family as it exists over the far-flung plains of the Canadian West. In Southern British Columbia, Lord found and described two new species,² and farther north, and on Vancouver Island, Prof. John Macoun and Mr. Taylor collected in a few localities.

Heron died before reaching the prime of his promising manhood. Fletcher, Taylor and Whiteaves passed away all too soon—not, however, having accomplished and recorded achievements in various departments of natural science that will long keep their memory green. Of those who were active in the early days of the club in collecting and studying the mollusca of Canada only two remain, Prof. John Macoun and the writer. One is spending the decline of his fruitful life in distant Vancouver Island. The other for ten

months of the year is far removed from his native valley and concerned about matters but little related to natural history. Owing to lack of a leader, Conchology has for some years been dropped from the list of the club's activities. With such wide and productive areas open for original investigation, the want of interest shown is greatly to be regretted. It is not so much to publish a record of work as a member of the club as to arouse fresh interest in others, and to facilitate the collection and study of our most numerous and least known shells that the following observations are submitted. My hope is that some of our younger members may be induced to devote a part of their leisure to what I am sure they will find a delightful diversion, both out of doors and over their cabinets.

The *Sphaeriidae* are small in size, only a few species exceeding half-an-inch in length. As they ordinarily lie buried—though only slightly—in the sand or other material at the bottom of streams, ponds and lakes, they are seldom seen—never, indeed, unless where, in very dry seasons, the water has receded or evaporated, when the shells may sometimes be observed on the exposed surface. But so generally are they distributed that it might almost be said they are to be found—they should certainly be looked for—wherever there is water that is not within the category known to golfers as "casual." Yet mere depressions that contain water for but short periods in any year often yield these and several other fluviatile shells.

To collect in quantity, except under conditions which seldom exist, a dredge of some kind is required. The beginner will find that a common bowl-shaped wire strainer will best serve his purpose. The size I find most useful has twelve meshes to the inch, and is six inches in diameter. I remove the handle and rim, which are too flexible and soon break, and substitute narrow, stiff, hoop-iron; but good results may be obtained without making such a change. The handle must be extended for all but very shallow water by whipping it firmly to a walking cane or light pole. On sifting in water the material raised by the dredge the shells will be

¹Annals of the Carnegie Museum, Vol. X, 1916, p. 431.

²Proc. Zool. Soc. of London, 1863, p. 69.

found. Each lot should be kept separate and numbered. A brief record under the same number on a field card or in a note book should be made. If the shells are stained they may be cleaned by placing them in a bottle containing sharp sand and soapy water. On no account should an acid be used. By rotating the contents the shells will be cleaned on the outside. Mere drying out then suffices, when the shells are minute; but when large, the animals must be removed after boiling, or rendered innocuous by immersion overnight in a five to one dilution of formalin—by far the more rapid process, as the tying or wrapping of each shell is not then necessary. When thoroughly dried, after treatment with formalin, the largest shells will not gape, or cause offence by their odor, and may be placed in the collector's cabinet.

As he examines his specimens he will observe that they fall naturally into three groups or genera. By far the greater number ordinarily found are minute shells, triangular in outline, very unequilateral, and, with rather sharp terminal beaks. They resemble small peas, and belong to a genus fittingly called *Pisidium*.

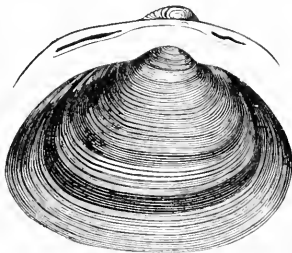


Fig. 1

Sphaerium sulcatum $\times 1\frac{1}{2}$.³

Other shells will be noticed which are larger, less inflated, though never exceeding half an inch in length; and usually more delicate and fragile. They bear little caps on the beaks, separated from the aftergrowth by a distinct furrow, and form the genus known as *Musculium*.

Still larger shells, often adorned with distinct color bands, denoting periods of arrested development, and others of no greater size than some *Musculia*, but of heavier texture, and as a rule more deeply striated, bear *Sphaerium* as their generic name. The term was devised by Scopoli, an Italian naturalist and chemist in 1777. It has priority to *Cyclas* (Brugaiere, 1789); and *Sphaeriidae*, according to the laws of modern zoological nomenclature has replaced *Cycladidae* as the proper designation of the family to which the little mussels belong.

1. *SPHAERIUM SULCAIUM* Lamarck, the largest of the genus in the species most commonly observed in the vicinity of Ottawa. It was described in 1818 by the famous French naturalist in his "*Animaux sans Vertèbres*," from specimens obtained in Lake Champlain. In the same year Thomas Say described the shell in the American edition of Nicholson's Encyclopedia as *Cyclas similis*, and Say's name may have priority. However, the Lamarckian name is more generally adopted, and is that used in the Club's lists.

S. sulcatum is the largest of the genus. It is oval in outline; distinctly, rather than deeply, striate; and, when adult, is usually banded with concentric dark lines, marking periods of arrested development such as occur every winter. The body color is of varying shades of grey or brown. Young shells are almost white.

But one other species, restricted in Canada, so far as known, to a single locality near Ottawa, approaches this in size. All bivalves found elsewhere that are about three-quarters of an inch in length, and have not the corrugated beaks which indicate membership in the family of our large mussels, or *Unionidae*, may safely be named *Sphaerium sulcatum*.

This species is found in many places within the city limits. It is common in the Rideau river, especially on the muddy bottom of the reach above the islands at Billings' Bridge. In the canal, after the water has been let out, it may be easily collected on the shoal near the right bank west of the Bronson avenue bridge, and anywhere above Hartwell's locks. Very large and perfect shells were obtainable at one time in the bay at the east end of the small lake below the outlet of Meach lake; but owing to accumulations of sawdust and bark the locality is now barren of this shell, though it still produces sparingly the most remarkable specimens I have ever seen anywhere of *Anodonta cataracta* Say (= *fluviatilis* Dillw.) and, in addition, *Lymnaea megasoma*, and the shell called *Physa lordi* in our lists.

In the Laurentides, north of Meach lake, *S. sulcatum* abounds, as in Gauvreau lake and its outlet, near Ste. Cecile de Masham, and in the brook flowing past the orchid swamp still farther north, so well known to members of the botanical branch of the Club, and now, alas! to many others. What a day that was, nearly thirty years ago, when, after visiting the brook and its outlet, Fletcher, Harrington and the writer were the first naturalists to discover the sequestered glades where the shy wood nymphs, then literally in thousands, swayed to one another in virgin grace and loveliness! Whoever studies shells should have a mind receptive to the

³For this and the other figures in the text I am under the greatest obligation to my friend Dr. Bryant Walker of Detroit, Mich.

delightful impressions that may be derived from flowers and birds, and the many strange four and six-footed creatures that he will encounter on his rambles in places seldom frequented by man.

A very fine form of *S. sulcatum* occurs on the Scott Graham farm in Nepean, now called Britannia Highlands. In dry seasons the narrow bottom of the stream lying about halfway between Carling Avenue and the Grand Trunk railway is exposed for some distance west of the boundary of the Shouldis farm. The shell may then be easily found in considerable numbers. At other times collecting is slow and difficult, even though the collector is equipped with a good dredge, and—what are indispensable in such localities—rubber boots. This stream is again productive near its outlet into the Ottawa below the Deschênes rapids.

conditions of environment. In fact nothing is so wonderful in nature as the adherence to type of every organized being properly regarded as a species. More interest is, however, manifested in departures from the normal than in persistence of type, just as variant races of men, like the giant Patagonians and pygmy Papuans, commonly attract more attention than races of ordinary stature. Variations from the usual form of *S. sulcatum* are few and limited. One is found in Bond lake, near Toronto. Another, which is well marked and constant, occurs in Masham, north of Ottawa, and, notably, in Lake Gorman, near Brudenell, in the county of Renfrew, at an elevation of about eleven hundred feet above sea level.

Dr. Sterki thinks it entitled to rank as a variety and calls it *palmatum*.⁴ He describes it as smaller

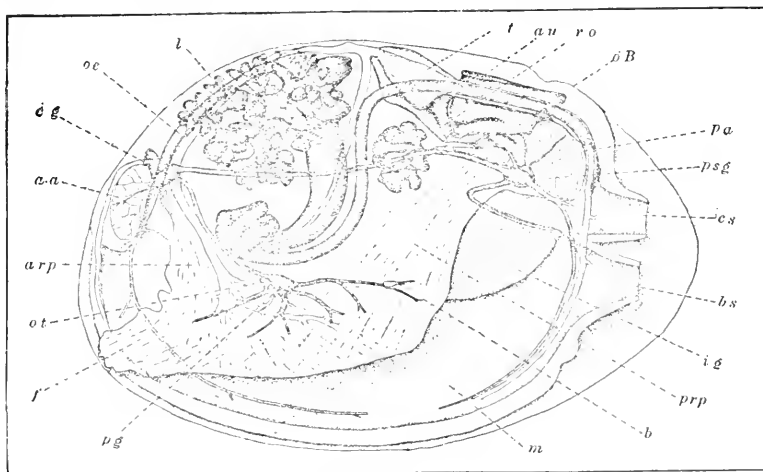


Fig. 2.

a.a.—Anterior adductor muscle.
a.p.—Ant. retractor-pedis muscle.
ar.—Auricle.
b.—Byssal gland rudiment.
bs.—Branchial siphon.
eg.—Cerebral ganglion.
cs.—Cloacal siphon.
f.—Foot.
ig.—Inner gill.
l.—Liver.

m.—Mantle.
ob.—Organ of Bojanns.
oc.—Oesophagus.
ot.—Otocyst.
pa.—Posterior adductor muscle.
pg.—Pedal ganglion.
prp.—Post retractor-pedis muscle.
psg.—Parieto-splanchnic ganglion.
ro.—Reproductive organs.
t.—Male follicle.

Fair specimens are obtainable in shallow water at Graham Bay station, at the intersection of the Richmond road and the Grand Trunk railway. A few miles farther to the southwest the shell is common in the creek north of Stittville; but nowhere have I found it in such numbers as in the stream about a hundred yards west of Ste. Justine station, in the county of Vaudreuil. In either place the shell may be readily collected in large numbers by means of a dredge with a quarter-inch mesh, such as is afforded by a kitchen utensil in common use.

As *S. sulcatum* is a true species, with an objective existence not depending on the opinion or whim of any systematist, it does not vary greatly in its characteristic features throughout the vast area over which it is disseminated, though it is occasionally modified in appearance by different

than the common or typical *sulcatum*, more inequipartite, the beaks being markedly anterior; less inflated, especially flattened over the lower part of the valves, more truncate anteriorly and posteriorly, inferior margin less curved; beaks narrower and little elevated; surface striae slighter; shell and hinge slighter.

In Lake Gorman the shell is quite abundant buried about an inch in the sand of the bay near the boathouse on the Rockingham road.

The animal of the variety *palmatum* has not been described. It is probably not distinguishable from the normal form represented in the following illustration, which may be regarded as typical of the anatomy of all the genus:

⁴Preliminary Catalogue of N. A. Sphaerilidea, An. Carg. Mus., Vol. X (1916), p. 432.

The foot is capable of great extension as may be observed if living shells are placed in a glass bowl or aquarium. Cilia in the bronchial siphon, and along the inner and outer gills and mantle, induce currents which bring diatoms and other minute organisms contained in the water into contact with the labial palpi, whence they pass into the stomach to be in part elaborated for the preservation and growth of the individual and the propagation of its kind, and in part rejected through the excurrent or cloacal siphon.

Unlike the *Unionidae* in which each individual is dioecious, that is, either a male or a female, as is the case also with our native oyster (*O. virginica*, Gmelin), though not, strange to say, with its European relative (*O. edulis*, Linn.), *S. sulcatum*, like all other species of the *Sphaeriidae*, is monoecious, or produces both sperm and ova within the same shell. However, it is not hermaphroditic in the way that many, if not all, pond and other snails are hermaphroditic. In their case, while each animal is perfectly bisexual, the conjunction of two individuals is requisite for fertilization. In the *Sphaeriidae*, on the other hand, the process of fertilization is similar to that which takes place within the closed keel of the pea blossom and other legumes. Cross

fertilization is impossible naturally, and could not be induced artificially were another Mendel to arise. The reproductive organs are located behind the stomach, and consist of racemose glands, the anterior of which produces sperm, and the posterior ova. A common genital duct leads in the cloacal chambers of the inner gills, where the young reach before birth, in the case of this species, a length of seven or eight millimeters, or nearly half that of the father-mother.⁵ If living shells are left for a day or two in water that is warmer or colder than that of their usual habitat, they will, ordinarily, be found to have produced a large number of nepionic young. These should be separately boxed and labelled with the name of the parent and will be found very useful when the collector is trying to identify shells which are no larger when aged than some Sphaeria are at birth.

(To be continued)

⁵The reproduction and growth of *S. sulcatum* are treated at length by Ralph J. Gilmour in *The Nautilus*, Vol. 31 (1917), pp. 16-28.

Note.—It is my intention to place in the Museum of the Geological and Natural History Survey at Ottawa specimens of the forms and varieties of *S. sulcatum*, and of the species mentioned in the continuation of this paper, of which I possess duplicates.

FIELD STUDY OF LIFE-HISTORIES OF CANADIAN MAMMALS.¹

BY RUDOLPH MARTIN ANDERSON, BIOLOGICAL DIVISION, GEOLOGICAL SURVEY, OTTAWA.

A recent and timely publication of the United States Department of Agriculture² calls attention to the gaps in our knowledge of the habits of many of the commoner species of mammals. The study of birds has been developed so extensively in a popular way in recent years through the Audubon Society movement, local bird clubs, and nature studies in the public schools, as well as technically by the scientific ornithologists, that the objects and methods of bird study have become fairly well known throughout the country, and the economic importance and aesthetic and sentimental value of bird life are becoming matters of common knowledge.

The study of mammals, though not less important in many ways, has not been developed so broadly or systematically. The study of the comparative anatomy and physiology of the major mammalian groups, through their closer relation

to the human subject, has received close attention, but the relations of species to one another and to their environment, and their life-histories, are undoubtedly less well known than the like relations of birds. It is true that the horse, cow, sheep, pig, and a few other mammals have been domesticated, but few attempts have been made to domesticate other species except in a sporadic way. A rather extensive but scattered literature has been developed concerning the deer, elk, moose, bison, antelope, and other large game animals, which are of interest to the sportsman. Unfortunately, this in many cases consists principally of the lore of hunting field and methods of capture, and what may be termed their more intimate history has been neglected until many of the species have been exterminated over most of their former ranges, and it is forever too late to obtain complete data in regard to these animals' relations to their primitive condition. Where efforts have been made, often too late, to conserve a remnant of these animals, to replenish the game of the sportsman, add to the food supply, or for other practical or sentimental reasons, it is found that there is a lamentable lack

¹Published by permission of the Geological Survey, Ottawa, Canada.

²Suggestions for Field Studies of Mammalian Life-Histories. By Walter P. Taylor, Assistant Biologist. September, 1919. U.S. Department of Agriculture. Department Circular 53. Contribution from the Bureau of Biological Survey, E. W. Nelson, Chief; pp. 1-8.

of knowledge even of an elementary kind regarding their habits.

Intimate knowledge of the furbearers was left largely to the trapper, whose interest usually did not extend beyond the means of outwitting the animal during the trapping season, putting its pelt on the stretcher or drying-board, and increasing his own personal fur-return for the time being. As the furbearers have become reduced in numbers, and the prices of fur have increased, the importance of the fur industry to the country is becoming recognized; measures of conservation are being proposed, and fur-farms are being started, the practical success of which depends largely upon the application of a knowledge of life-histories or habits of the animals which are to be reared.

Many species of animals which have no direct economic value as food or for their fur, or skins, are nevertheless often of enormous indirect importance, and must be recognized as beneficial, or means taken to combat them as detrimental to the interests of man. Rats, mice, ground squirrels, etc., have been recognized as carriers of trichinae and the germs of bubonic plague, anthrax, and other diseases. Ground squirrels, prairie dogs, pouched gophers, and other rodents have caused such extensive damage to grain-fields, running into millions of dollars annually in some parts of the country, as to make necessary concerted action by the government and by associations of individual farmers. Rabbits, hares, voles (field-mice), and the like frequently cause great damage to fruit trees and young forest trees. Coyotes, wolves, and mountain lions take a large toll of the sheep, cattle, and horse-raising industries, and thousands of dollars had been expended in indiscriminate bounties without commensurate results until systematic study of these carnivorous pests pointed a way for their practical elimination in many districts.

The ravages of "The house rat, the most destructive animal in the world," are given by Lantz (Yearbook of the United States Department of Agriculture, 1917), from studies made by the Biological Survey in 1908, as amounting to actual losses in produce and other property in one year in the two cities of Washington and Baltimore, of \$400,000 and \$700,000 respectively, the sums being nearly in ratio to the population. In the same report he quotes a recent statement of the Women's Municipal League of Boston to the effect that losses from the rats in that city amounted to \$1,350,000 annually. Losses in Pittsburg, Pa., have been estimated at over \$1,000,000 a year, and no doubt the present values of produce would greatly increase these estimates.

While the study of the living animal is of as

great interest and attractiveness to the naturalist as any other branch of natural history and has consequently an aesthetic and sentimental value, it can be shown to have a very practical value also. As Professor Herbert Osborn says: "Not a single farm product but is affected directly or indirectly by some animal activity."

Dr. Taylor, in his recent paper, states that the leading museums have been acquiring exhibits and studying material representatives of different groups of birds and mammals, until at present the American collections are in many respects unsurpassed by those of any other country in the world, and that the relative completeness of research collections permits increased attention to be paid to the study of life-histories.

It is, of course, well recognized that species closely resembling each other often have quite different habits, and to avoid misapprehension and confusion of records we must have a certain amount of systematic taxonomic study before detailed investigations can be made along other lines. Valuable observations may be made without drawing the lines of differentiation too finely, but in general, we must learn the names of our animals before we can write about them. In other words, we must have pegs on which to hang our observations, if they are to be of value.

Unfortunately, we must admit that there is not in Canada today any collection of mammals approaching in completeness, even in Canadian species, several collections in the United States, among which may be mentioned the Biological Survey and the United States National Museum of Washington, the American Museum of Natural History of New York, the Museum of Comparative Zoology of Cambridge, and possibly two or three others. Many American zoologists have worked in Canada for the enrichment of American museums, and Canadian naturalists have done intensive work in many districts, but many regions of Canada have even yet been little worked in the field of mammalogy.

The development of a national collection of the mammals of Canada, as well as of other forms of animal life, should be of interest to all Canadians. Such a collection is useful as a place of reference for students from all parts of the country, and a permanent repository for specimens of many species which may ultimately become extinct. In addition to the national collection, represented by the Victoria Memorial Museum, under the Geological Survey, of the Department of Mines, each province should have a representative collection of the mammals and other vertebrates found within its borders. The private collector has a field of his own for investigation and experiment which should be en-

couraged, for he often has opportunities, resources, and freedom to carry on important investigations along side paths of knowledge which the government investigator or professional naturalist is not able to follow at his own inclination. The universities, colleges, and other schools, scientific surveys and commissions, local museums and associations for the protection of fish and game, all have an opportunity to do good work for the country in this field.

The value of detailed knowledge in fields which have previously appeared seemingly trivial, has been illustrated many times during the late war. As an example of this, the pest of rats became exceedingly serious at the Bush Terminal of the port of New York, the principal shipping point of the immense amount of stores required for the American or other expeditionary forces of the Allies. The use of poison was impracticable around such great quantities of food stuffs, but by detailing field biologists to the Sanitary Corps and directing their field experience to the problem of exterminating rats, within a few months more than 50,000 rodent allies of the enemy were accounted for, and it is estimated that several million dollars worth of commissary and quartermaster stores were saved at a critical time.

The secretive and nocturnal habits of some species of small mammals are responsible for so little being known of them. They are correspondingly more difficult to photograph than the birds. For this reason field photographs of mammals—their nests, runways, tracks, and general habitat, are particularly desirable. Although the mammals as a rule are more shy than the birds, and are less often seen; the larger animals on account of constant pursuit by man for generations as objects of sport and of food, and the smaller ones from fear of swooping birds of prey, the presence of the mammal in a certain region may be detected where the flying bird leaves no trace. The pads of little paws on dusty roads or the muddy brinks of pools or streams, or the delicate tracery of tracks on the newly fallen snow, leave a record, which though evanescent, may be read and interpreted by the initiated, and lends interest to walks in the great out-doors.

In a field like this no one can cover every detail, and the notes of many persons are needed for working out complete life-histories of any species, even the commonest. A young observer may find out something that was not known before and, in classic phrase, "add something to the sum total of human knowledge." As a suggestion to aspiring naturalists who are at a loss to know what to do or how to begin, we can not do better than quote from Dr. Taylor's paper cited above:

DATA THAT ARE IMPORTANT.

MEANS OF DETECTING PRESENCE OF PARTICULAR SPECIES.

"Tracks, distances between footfalls; differences in tracks with different speeds or movements of animal.

Feces—abundance, shape, size, color, composition, place of deposit.

Claw marks on trees, logs, or ground.

Tooth marks on wood or bone.

Wallows, dust baths, beds, forms, nests, shelters, runways, holes, trails, cropped or harvested vegetation.

HABITAT RELATIONS.

Relation of soil, rocks, water, air, climate to habits and distribution.

Effects of unusual climatic conditions, as storms, floods, and forest fires; degree and rapidity of recovery from disaster.

Relation of animal populations to climatic cycles.

INTERRELATIONSHIPS OF SPECIES.

Friends.

Enemies—times of activity; enemies in youth, middle age, old age.

Prey—modes of capture.

Parasitic habits of species with reference to each other.

Parasites, internal and external.

Bacteria and disease germs (carriage and transmission of disease to stock or to mankind; species as victims; decimation of animal populations; periodicity of contagious diseases in animals; degree and rapidity of recovery).

Adaptations of animals to each other or to plants.

Competition between species, particularly between those closely related.

TIMES OF ACTIVITY.

Hours of beginning and cessation of daily activity.

Unusual activity, as of diurnal species at night or of the nocturnal by day.

MIGRATION.

Local or general movements before and after breeding.

Dates of appearance and disappearance (especially of bats).

Extent and direction of movements, local and general.

Causes of migration—food supply, climatic, physiological.

Unusual migratory movements, as the spasmodic irruptions of lemmings, with causes therefor.

HIBERNATION AND ESTIVATION.

Date of entering upon and emerging from hibernation.

Causes of hibernation and estivation—the relation of climate, soil, physiology, and food supply.

Condition of animal before, during, and after hibernation.

Details as to completeness or incompleteness of torpidity.

Place of hibernation or estivation.

Habits associated with hibernation and estivation.

MOVEMENT.

Modes of running, jumping, climbing, digging, swimming, flying.

Gait; speed; endurance.

Other activities.

VOICE AND OTHER MEANS OF INTERCOMMUNICATION

Calls in general; courting; alarm; challenge; warning calls.

Descriptions of barking, baying, screaming, howling, squeaking, squealing, singing, roaring, bugling.

Warning attitudes; flash signals.

Emission of glandular secretions.

Odor posts.

Touch.

Other means of intercommunication.

Organization of communities—leaders, sentries, rank and file.

HABITS ASSOCIATED WITH FEEDING AND DRINKING.

List of foods eaten.

Food at different seasons.

Physical characteristics and habits associated with food getting.

Conveyance and storage of food; hay making.

Dependence on water; times and manner of drinking; other associated habits.

INDIVIDUAL CHARACTERISTICS.

General disposition and temperament; intelligence; attitudes; strength; vitality; tenacity of life; courage; esthetic sense; eating of young by parents; cannibalism in general; degree of sociability; playfulness; length of life.

Sanitation, cleanly or filthy habits.

Reactions to sound, light, odor, taste, touch.

Relation of physical characteristics to sense reactions.

RELATION OF CHARACTERISTICS AND HABITS TO EXISTENCE AND SURVIVAL.

Movements.

Attitudes.

Instincts.

Intelligence.

Coloration—concealing, disruptive, directive, warning, mimicking.

BREEDING HABITS.

Courting antics.

Relations of the sexes in general; polygamy (manner of acquisition of harem by male, mode of

protection of harem, bachelor males); polyandry; promiscuity; monogamy.

Dates of heat and copulation; associated habits.

Length of period of gestation.

Date of birth of young.

Number of young.

Family life; relation of father to family; care of young—feeding; mode of carrying; how long cared for by parents; precocious or backward; length of time in nest; behavior.

Behavior of adults in postbreeding season; in winter.

Hybridization between related species.

NESTS, SHELTERS, AND OTHER PLACES OF RESORT.

Natural resorts at different seasons.

Shelter chambers in general.

Lairs; dens; forms; beds.

Nests—plan, elevation, accurate measurements; storage chambers; breeding chambers; chambers for deposit of excrement or for other purposes.

Nests for different purposes; unoccupied nests.

Approaches to nests—trails, burrows, tunnels, or runways; protection of nests through the closing of burrows during the daytime or in other ways.

Habits associated with nest approach.

Extent of home range.

MISCELLANEOUS.

Are any mammals strictly crepuscular?

Periodic phenomena of any kind of mammals, aside from migration and hibernation.

Habits as affected by the seasons of the year.

Effect of long days, very dark days, full moon, dark of the moon, on activity.

Use of glands of various sorts, as hip glands of meadow mice, metatarsal glands of deer, musk glands, anal glands.

Weights and dimensions of bats; precise hour of appearance in the evening and disappearance in the morning; numbers and habits as observed in caves; relative numbers of the sexes; methods of hanging; condition of females with reference to pregnancy.

PRESENT AND FORMER STATUS.

Present and former numbers of valuable species, as fur-bearing and game animals, and of pests or those otherwise important; causes of increase or decrease.

Estimates and counts of numbers of animals per unit of area.

Fluctuations in numbers from year to year, and causes.

Plagues, due to unusual increase or destructiveness of species; origin, course, and virulence; natural checks and methods of control.

WILD LIFE AND THE COMMUNITY.

Local names; local ideas concerning wild life.

Sentiment regarding game laws and legislation.

Trapping and hunting methods in local use; prices received for pelts or animals sold.

Relation of mammals to the public health; to agriculture.

Possible undeveloped resources in mammals, as of flesh for food, fur or hides for clothing, or other useful animal products for various purposes.

Possibilities of utilization, through domestication or semidomestication, of beneficial species."

No one individual can hope to acquire full information on all the items listed, but any naturalist who knows a species at all can put down something, and apparently trivial things often turn out to be

really important when considered in their relation to other factors. "These relative lines of inquiry include problems in scientific agriculture, geographical distribution, phenology, migration, ecology, physiology, medical zoology, behavior, game protection and the conservation of natural resources, morphology, heredity, organic evolution, and economic zoology."

The Division of Biology (Mammalogy), The Geological Survey, Ottawa, Canada, is interested in building up a collection, and in gathering of life-histories and other data in regard to the mammals of Canada, and correspondence is solicited from any person or institution working along these lines, and advice or suggestions will be gladly given as opportunity is offered.

BIRDS IN RELATION TO SUNFLOWER GROWING IN MANITOBA.

BY NORMAN CRIDDLE, TREESBANK, MANITOBA.

There are several indigenous species of sunflower in Manitoba some of them such as *Helianthus maximiliani* being weeds of importance while others merely add to the attractiveness of the landscape, without being otherwise of interest to mankind. All, however, have their values in the economy of nature and for ages past have proved a valuable source of food supply for certain native birds, as well as for several rodents. While animals thus take heavy toll of the sunflower seeds, they also assist materially in the spread of the species and it seems at least possible that these unusually large seeds have been evolved for just such an end. In other words, the plants offer an especially attractive food, in return for which the animals carry a certain indefinite percentage of the seeds far beyond the range that they would otherwise fall—an unconscious form of reciprocity very commonly met with in the realms of nature.

Under the ordinary course of events, the conditions depicted above might have continued almost indefinitely, but, as frequently happens, man has intervened. Sunflowers have become of economic importance from the human standpoint, the larger ones for their seeds and the smaller kinds for fodder purposes; this apart from the fact that many are grown in gardens as ornamental plants. We have, therefore, to view the relations of birds to sunflowers in another light presumably, again placing the economic importance before the aesthetic. This I have endeavored to do in the following sketch. My observations are drawn largely from notes made in a garden and refer especially to a bushy type of sunflower originated by my brother Stuart. It

seems well to mention also, that the garden is surrounded by shrubs and young spruce trees, planted to shelter the more tender plants therein.

At Treesbank, Man., sunflowers are usually above ground by the middle of May and it is at this time that the first injury is done to them by birds which eat the cotyledons. In doing this the birds often follow the rows to the end and practically destroy every plant. The House Sparrow having a bad name, at once got the blame for this injury and we accordingly set a watch who was prepared to shoot the none too popular bird. But suspicion may be misdirected as it proved to be in this case. There was the thief at work, pulling and eating the plants, and it proved to be no other than the White-throated Sparrow, one of the most popular of all the feathered tribe. No wonder the gun was lowered or that the watcher, who happened to be my brother Evelyn, should return to the house disgusted at his discovery. Later we found that the White-throat made a practice of sunflower eating and that it continued from the time of its arrival in early May until about the first of June when the nesting period commenced. Occasionally other sparrows, such as the White-crowned or Harris' Sparrow would pull up a few plants, but they were only casual depredators whereas the White-throat went in search of the plants daily. Naturally such injury would not take place in the open country though it is possible that Longspurs or other birds might prove equally troublesome under field conditions.

The injury to the newly sprouted sunflowers is over early in June and from that time no further

damage takes place until the plants commence to form seeds. This second attack commences about the middle of August and continues until the plants are harvested in early October. Four birds stand out prominently in the work of destruction at this time, namely the American Goldfinch (*A. tristis*), the Pine Siskin (*S. pinus*), the Crossbill, or as it is known in these parts, the Red Crossbill (*L. curvirostra minor*), and the White-winged Crossbill (*L. leucoptera*). The first mentioned is by far the most persistent of all of these and it is probable that fully 80 per cent of this bird's food consists of sunflower seeds when they are available. The ripening of the seeds also coincide with the Goldfinch's breeding season and in consequence the young are largely reared on the same food supply. Later as the nestlings learn to fly all find their way to the sunflower patch and from then on make their headquarters in the vicinity. To see one of these beautiful little birds resting upon a sunflower at once sets one speculating as to the probable origin of colors that harmonize so remarkably with the plant the birds feed upon. Who could possibly select a more perfect background for concealment and yet endow a bird with such brilliant colors at the same time? The females and young are also wonderfully hidden when resting upon their favorite food plant and it, therefore, seems strange that the name sunflower bird has not been applied to this species.

While sunflower seeds unquestionably form the chief food of Goldfinches during the autumn months, the birds also consume a variety of other seeds such as Gaillardia, thistle, dandelion, and many others of composite plants. All such seeds are usually gathered while the bird rests upon the plant and the seeds dropped are seldom sought after on the ground.

Pine Siskins though not so persistent sunflower-seed eaters as their relatives the Goldfinches, are, nevertheless, quite destructive in the course of a season and when in large flocks might do serious harm. With us, however, a family or two are all that visit the neighborhood in autumn and they would not, therefore, be a serious menace to a large field, though troublesome enough in a garden where but a few thousand plants are grown. Both Pine Siskins and American Goldfinches leave us in October; the latter have all gone by about the 20th, while the former remain a week or more longer. Indeed, there are records of Siskins being seen in winter time though I have no personal records of winter birds. They return in May and breed in the woods close at hand.

The two Crossbills have such similar habits that they may well be treated as one in this article. They

are, apparently, both residents throughout the year and breed in the spruce woods close by.

Crossbills are not regular visitors to the sunflowers but being great wanderers probably arrive accidentally while in search of spruce cones. Seeing the plants, however, they soon descend upon them and are quickly engaged in tearing the heads to pieces. They usually come in flocks of half a dozen or so, these being doubtless single families, as a majority are in juvenile plumage. Indeed, observation shows that the young birds are far more persistent in their depredations than the adults, and it may be that like various other birds, these have a habit when first seeking food for themselves which they later abandon for the more general one of gathering the seeds of the coniferous trees. This, however, is only partly true as I have observed perfectly colored males as busy in the work of destruction as were the young alongside.

Crossbills though not as persistent sunflower-feeders as the Goldfinches are in other respects even more injurious owing to their lack of discrimination in selecting suitable heads. They may thus tear to pieces half a dozen heads before discovering one with seeds sufficiently mature for food purposes. Under these conditions the damage done in a day is often severe. In the case of the garden referred to, the depredations become so extensive that I eventually went out with a gun, but to my joy found it unnecessary, as the handsome marauders had departed.

Of the other eaters of sunflower seeds little need be said as their influence on the ultimate production is insignificant. Blue Jays prefer the larger seeds and in autumn store them for future use. House Sparrows and other sparrows gather them from the ground as do also Mourning Doves and the various species of blackbirds. Chickadees are almost daily visitors to the sunflower patch in late autumn and during the winter. No one, however, begrudges them their tiny share and that they do feed upon the seeds is more of interest as a means of attracting them than otherwise.

This then is a brief sketch of the birds that might affect the industry of growing sunflowers, or their seeds, for agricultural purposes; none of them, however, are particularly abundant though there is no gainsaying the fact that even in their present numbers they might cause considerable loss on a large field. If the sunflower industry ever develops, as it promises to do, then it may be necessary to go further into the matter and perhaps a gun will be required. In our garden, where we were experimenting and crossing, losses, of course, had to be guarded against. For the seedlings we used various devices for hiding the plants and placed numerous

obstructions along the rows to prevent a continuous thoroughfare. As the seeds began to ripen we covered the heads with cheese-cloth. By these measures of precaution we managed to obtain sufficient seed for our purpose, which was about a tenth of the total grown, the rest going to the birds. To be

permitted to watch these little robbers day after day, busily engaged in pulling out the seeds was to me, at least, sufficient compensation, and for those who love birds and gardens, I know of few better attachments than a hedge of sunflowers.

NOTES ON THE BEHAVIOUR OF THE CHIPMUNK.

By A. BROOKER KLUGH, M.A., BIOLOGICAL DEPT., QUEEN'S UNIVERSITY,
KINGSTON, CANADA.

While in camp at Lake Missanog, Frontenac county, Ontario, from August 19 to September 19, 1919, a chipmunk (*Tamias striatus lysteri*), had its abode in the vicinity of our tent. This individual had an unusually short tail and deep coloration, and consequently could be readily distinguished from other chipmunks in the neighborhood.

HOME RANGE. The home range of this chipmunk was 100 yards by 75 yards, and she was never observed out of this area.

FOOD. She was feeding on three things which I have not previously seen this species eating—the fruits of the bunch-berry or dwarf cornel (*Cornus canadensis*), the fruits of the wild lily-of-the-valley (*Maianthemum canadense*), and the seeds of the star-flower (*Trientalis americana*). As far as I could ascertain she was not storing any of these articles of food.

I tried her with various food substances and found that neither meat nor sweet substances, both of which are relished by the red squirrel, were accepted, but only seeds, fruits and tubers.

By far her favorite item among the foods offered her was corn—either raw or boiled. While she sometimes ate a kernel or two she carried most of it away in her pouches. In loading up her pouches she placed the kernels alternately first in one pouch and then in the other, and when the pouches were nearly full she shoved the last few kernels in with one of her forepaws. A full load, as tested several times, consisted of thirty-one large kernels of corn—equal to two heaped-up tablespoonfuls. When full each pouch was as broad as the head, when viewed from above.

NOTES. Three different notes were used by this chipmunk—the sharp “chip” which appeared to indicate a state of unrest, the “chip-chir-r-r” of alarm, and the resonant “chonk-chonk-chonk.” The latter note is an intercommunication call and is rarely repeated for any length of time unless a response is evoked. This call is frequently begun quite softly and slowly, but when answered in kind both tone and tempo are increased. In uttering this note the

cheeks are slightly distended before each “chonk” is emitted.

PSYCHOLOGY. The shortness of the period of observation made any detailed study of the psychology of this individual an impossibility, but I was able to secure accurate data on one phase of this subject—the rapidity of the formation of associations. After I had placed kernels of corn for her a few times I began to throw kernels to her. At the first trial the sudden motion of my arm in throwing naturally frightened her, as any sudden motion will do with any wild animal. At the second trial she started only slightly and came and picked up the kernels, and at the third trial she showed no alarm at the motion, but ran immediately towards me and picked up each kernel as it fell. I next threw her half-a-dozen kernels, each one nearer to me than the last, and then held out the cob near the ground, when she came up and bit the corn from the cob. After this she associated the holding out of anything with the procuring of food and came at once. The third test made was to ascertain her ability to associate sounds with the securing of food. I held out a cob of corn and made a squeaking noise with my lips, and after five trials, two on one day and three on the subsequent day, she came running up on hearing this sound, even though I held nothing extended towards her. The rapidity with which she made these associations exceeded my anticipations very considerably.

That associations remained for some length of time was shown by an incident which was not planned as an experiment. My Indian friend, Sowatis Lachance, had given me a cob of the peculiar hybrid corn which he grows, in which the kernels are of various and brilliant colors—red, pink, purple, brown, dark grey, yellow and white. This I had placed on the top shelf of a set of shelves in the tent. Early the next morning the chipmunk came into the tent, climbed up to the shelf, and stripped the cob. For five days subsequently she continued to investigate that top shelf, visiting it

regularly every morning and usually several times during the day, though no more corn was placed there, nor anything else edible.

After the chipmunk had learned to come and take corn from the cob held in my hand she would

come after it no matter where I held the cob, running up my leg and sitting on my knee while loading up her pouches, and would sit up on a cob and strip off the kernels even when I lifted the cob up in the air.

THE ORNITHOLOGICAL COLLECTOR AND THE LAW.

BY HOYES LLOYD.

As the provisions of the Migratory Birds Convention Act and Regulations which concern the scientific collector are perhaps not fully understood by all collectors in Canada, a short explanation of the status of the collector, with respect to this law, seems desirable at the present time.

The federal bird protection law, which is known as the Migratory Birds Convention Act, allows *birds protected by the Act* to be taken, shipped, transported, or possessed for scientific purposes, but only by persons holding a permit from the Minister of the Interior.

This permit is required by all museums or individuals wishing to collect birds, nests, or eggs, protected by the Act.

The director of a recognized museum should make application for each of his collectors. Individual collectors must furnish written testimonials from two well-known ornithologists before their application can be considered. Applications should be addressed to the Commissioner, Dominion Parks Branch, Department of the Interior, Ottawa.

All applicants should state the province in which they wish to collect. They may be required to make returns stating the result of their work. Every encouragement is offered the collector, who is honestly working to extend our knowledge of Canadian birds, but useless waste of bird life will not be allowed.

A package in which specimens of birds, protected by this Act, is to be shipped must be marked on the outside with the number of the permit, the name and address of the shipper and a statement of the contents. It is contrary to the law to ship any of the protected birds, eggs or nests and the use of the mails is forbidden, unless the packages are so marked.

So that every Canadian naturalist will understand the principles governing the issue of these permits, this article is concluded by repeating these principles in full. They are printed with and form a part of every scientific permit.

PERMIT PRINCIPLES.

Permits to take migratory birds, their nests and eggs, under the Migratory Birds Convention Act

and Regulations are granted for the sole purpose of scientific study and not for the collection of objects of curiosity or personal or household adornment. Therefore only such persons as take a serious interest in ornithology, and are competent to exercise the privilege for the advancement of knowledge, are eligible to receive such permits.

It is expected that the holders of permits will use them with reasonable discretion, taking only such specimens as their scientific needs require and avoiding unnecessary waste of life. The habitual taking of numbers of individuals for the purpose of obtaining a few specially desirable ones is deprecated and it is urged that the collector take no more specimens than he has reasonable prospects of caring for and will conscientiously endeavor to properly prepare each and all when taken.

It is also recommended that the holders of permits will, so far as is consistent with their object, be considerate of the local feeling in the neighborhood where they collect and will demonstrate both by actions and speech that the scientific collector is sympathetic towards the principles of wild life conservation and not the rival of legitimate sportsmen.

It is required as an evidence of good faith that holders of permits label their specimens with the customary scientific data and properly care for them not only at the time of collection but thereafter, giving them all reasonable protection against insect pests and other agencies of destruction, and will not permit them to be destroyed through carelessness or indifference.

As permits are granted for the purpose of general scientific advancement and not for individual benefit, specimens taken under them are to be regarded as being in the nature of public trusts, and should be accessible to all duly qualified students under only such reasonable restrictions as are necessary for their protection or as is consistent with the owner's work.

Finally it is urged that provision be made so that specimens taken will ultimately find their way into permanent or public collections where they will be available for study by future generations and not be wasted and lost through neglect.

While all these conditions are not strictly mandatory, and their spirit will be liberally interpreted, they will be considered in the granting or renewal of each permit, and evidence of gross violation of them may be deemed sufficient ground for the re-

fusal of an application or for the revocation of any permit already granted.

It is hoped and expected that the justice of these principles will be realized and that collectors will co-operate in advancing science to the utmost without unnecessary waste of valuable bird life.

RIBES DIVARICATUM X RIBES LOBBII.

By J. K. HENRY, VANCOUVER, B.C.

A few years ago Mr. George H. Knight, nurseryman, Mount Tolmie, Victoria, B.C., found a peculiar gooseberry growing among *Ribes divaricatum* Dougl. and *R. Lobbii* Gray, at Mill Hill, Vancouver Island. He removed it to his nursery and propagated it. It fruited freely, as *R. Lobbii* usually does, producing claret-colored berries of excellent flavor. Finally blundering workmen grubbed it up. The plant is now known to exist only in the nursery of Mr. George Fraser, Ucluelet, to whom Mr. Knight, remembering his friend's interest in hybrids, had sent cuttings.

In April, 1919, Mr. Fraser sent me flowering specimens of the plant, which show pretty clearly that it is, as Mr. Fraser surmised, a natural hybrid between *R. divaricatum* and *R. Lobbii*. The combination of two such important characteristics as the hairy style of *R. divaricatum* and the glandular ovary of *R. Lobbii* is alone almost conclusive evidence of its parentage.

In general appearance the plant looks like a small-flowered specimen of *R. Lobbii*. It has the pubescent shoots, the triple spines, and, in its spring form, the glandular leaves and the glandular-pubescent petioles of that species. The pubescence of the mature petioles is, however, hardly at all glandular. The evidence of its hybrid nature is found not only in the combination of these characteristics of *R. Lobbii* with the small flowers of *R. divaricatum*, but especially in the flowers and the inflorescence. The relationship of these plants may be further indicated by the following analysis:

R. DIVARICATUM.

Flowers (ovary and calyx) 7-10 mm. long; in number 1-4, usually 2; peduncles smooth; pedicels smooth, longer than the bracts; ovary smooth; style

hirsute; calyx-tube greenish, smooth; sepals dark purple, smooth; petals fan-shaped; anthers green.

R. LOBBII.

Flowers (ovary and calyx), 14-20 mm. long; in number 1-4, usually 1 or 2; peduncles glandular-pubescent; pedicels glandular-pubescent, shorter than the bracts; ovary glandular; style smooth; calyx-tube dark red, pubescent; sepals dark red, pubescent; petals wedge-shaped; anthers purple.

R. DIVARICATUM X R. LOBBII.

Flowers (ovary and calyx) 8-10 mm. long; in number usually 3, (D); peduncles smooth or nearly so, (D); pedicels smooth or nearly so, longer than the bracts, (D); ovary glandular, (L); style hirsute, (D); calyx-tube greenish, nearly smooth, (D); sepals dark red, pubescent, (L); petals wedge-shaped, (L); anthers green, (D).

(D and L indicate that the characteristics are those of *R. divaricatum* and *R. Lobbii* respectively.)

While this evidence is fairly conclusive, one cannot affirm with certainty that the plant is a hybrid until the character of its progeny is known. At Ucluelet the plant does not set fruit. At Victoria it fruited abundantly, the claret-colored berries being somewhat intermediate in hue between the dark red of *R. Lobbii* and the deep purple of *R. divaricatum*. Further, one hesitates to be dogmatic, since not only are *Ribes* hybrids produced with difficulty by the horticulturist, but natural hybrids of this genus are unknown in North America. This note is published pending further investigations in order that collectors on Vancouver Island and in the States of the Northern Pacific coast may be on the look-out for the plant.



A NEW CLIFF SWALLOW FROM CANADA.

BY HARRY C. OBERHOLSER.

The form of *Petrochelidon albifrons*¹ inhabiting most of western Canada proves to be subspecifically distinct from the typical race. It may be described as follows:

PETROCHELIDON ALBIFRONS HYPOPOLIA, subsp. nov.

Chars. subsp.—Similar to *Petrochelidon albifrons albifrons* from eastern United States and Colorado, but larger; frontal band paler, more whitish; breast more grayish (less ochraceous).

Description.—Type, adult male, No. 195055, U. S. Nat. Mus., Biological Survey collection; Fort Norman, Mackenzie, June 11, 1904; E. A. Preble, original number, 1830. Forehead creamy white; crown metallic blue black; hind neck brownish gray; back and scapulars, like crown, but streaked with brownish gray and whitish; rump cinnamon; upper tail-coverts light fuscous, the tips of the feathers whitish; tail fuscous; wings fuscous black, with a slight metallic bluish or greenish sheen, the inner edges of the primaries and secondaries paler and on terminal portion narrowly edged with brownish white, the outer webs of the inner secondaries and of the tertials margined with the same, and the greater wing-coverts slightly tipped with paler brown; lores and narial bristles, brownish black; sides of the head below the eyes, together with the upper throat, between chestnut and bay; chin and centre of the lower throat, black; sides of neck light brownish gray; breast, sides, and flanks, light brownish gray, the centre of the breast washed with pale cinnamon; remainder of the lower parts dull white, the crissum washed with chestnut; lining of wing light brownish gray; edge of wing barred with dull light cinnamon and brownish gray.

Measurements.—Male:² wing, 110-115 (average, 112.1) mm.; tail, 49-52 (50.7); exposed culmen, 6-8 (7.2); tarsus, 11-13 (12.3); middle toe without claw, 10.5-12 (11.3).

Female: wing, 108-111.5 (average, 110.2) mm.; tail, 49.5-51.5 (50.7); exposed culmen, 6-8-7.2 (7.0); tarsus, 13; middle toe without claw, 12-12.5 (12.3).

Geographic distribution.—Breeds in northwestern North America, north to Mackenzie and central Alaska; west to central British Columbia; south to Montana; and east to Alberta and Mackenzie. Migrates through Wyoming and California. Winters probably in South America.

* This is the largest of the races of *Petrochelidon albifrons*, and differs from *Petrochelidon albifrons tachina* still more than from the typical *Petrochelidon albifrons albifrons*. The difference in measurements between *Petrochelidon albifrons albifrons* and our new Canadian race may be seen by comparison of the figures above given for the latter with the following dimensions of *Petrochelidon albifrons albifrons* taken from Colorado, Wyoming, and eastern United States birds.

Male:³ wing, 105-112 (average, 107.6) mm.; tail, 47-51 (49.9); exposed culmen, 7-8 (7.2); tarsus, 12-13 (12.6); middle toe without claw, 11-12 (11.8).

Female:⁴ wing, 102-109 (average, 107.2) mm.; tail, 47-51 (48.9); exposed culmen, 7-8 (7.4); tarsus, 11.5-13 (12.5); middle toe without claw, 11-13 (11.9).

Breeding birds from Dickey in southern Idaho, the Snake River in eastern Washington, and from Ashcroft in central southern British Columbia, are apparently referable to *Petrochelidon albifrons albifrons*. Specimens from Greybull and Saratoga, Wyoming, are in size about half-way between *Petrochelidon albifrons albifrons* and *Petrochelidon albifrons hypopolia*, but in color they are decidedly nearer the former, and are here included under that race. A single specimen from Pembina, North Dakota, indicates that the bird from at least the northeastern part of North Dakota is the eastern form. The present new race migrates through the western United States, as spring examples from Wyoming and southern California indicate.

All the specimens of *Petrochelidon albifrons hypopolia* examined are included in the following list:

Alaska. Nulato (May 24, 1867); St. Paul Island (about June 10, 1918).

Arizona. Tucson (April 18, 1918).

Mackenzie. Fort Resolution (June 23, —); Fort Good Hope (June 20, 1904); Fort Norman (June 11, 12, and 14, 1904).

California. Laguna Station, San Diego County (May 4, 1894).

Montana. Milk River at 49° north latitude (July 25, 1874); Johnson Lake (June 3, 1910); Fort Benton.

Wyoming. Ten Sleep (May 31, 1910).

¹For the change of name from *Petrochelidon lunifrons* to *Petrochelidon albifrons*, cf. Rhoades, Auk, XXIX, No. 2, April, 1912, pp. 193-195.

²Five specimens, from Alaska, Mackenzie, and Montana.

³Seven specimens.

⁴Eleven specimens.

THE CLIMATIC INTERPRETATION OF TWO EARLY ORDOVICIAN MUD-CRACK HORIZONS.*

By E. M. KINDLE.

A mud-crack horizon which has not been previously reported occurs in the Grenville section on the Ottawa river. This horizon which is exposed on the north bank of the river immediately above the Canadian Northern railroad bridge is in the upper part of the Beekmantown formation. Its relationship to the associated beds is indicated in the section below which was studied by the writer in company with Dr. M. E. Wilson.

Section above C.N.R. bridge at Hawkesbury.

- | | |
|---|------|
| a. Sandstone with coarse sand and fine gravel in upper part and fine sand in lower. Numerous vertical worm tube impressions (Base of Chazy) ----- | 2' |
| b. Thin bedded limey shale (top of Beekmantown) ----- | 2' |
| c. Dark grey fine grained limestone with botryoidal fracture ----- | 8' |
| d. Coarse textured grey limestone full of small fossils ----- | 1'6" |
| e. Thin bedded shaly limestone ----- | 3' |
| f. Heavy bedded grey limestone and covered 10' | |
| g. Thin bedded grey argillaceous and magnesian limestone with mud-crack throughout the upper 4' Resembles sandstone when weathered ----- | 6' |

Between *a* and *b* of this section there is probably a disconformity. All of the Ottawa valley sections show a rather abrupt change in lithology at this horizon. The change in fauna is equally marked.

The very sharp and clearly defined character of the fossil mud-crack in bed *g* of this section is its most noteworthy feature. The mud-crack polygons exhibit a rather unusual and significant feature in their upturned margins. Many examples of this mud-crack show the unwarped margins of the polygons rising above the centre as much as $\frac{1}{4}$ inch. Associated with these is a surface structure suggesting raindrop impressions.

It has been shown experimentally¹ that this type of mud-crack results from the dessication of fresh water mud and that flat or slightly downwarped polygons develop from saline mud. Since mud-crack with upwarped margins is produced only in fresh or brackish water muds we must conclude that this mud-crack horizon represents intertidal mud-flats which were covered at high tide by relatively fresh waters comparable perhaps with those of the upper Baltic sea. The reappearance of a marine fauna in the section a few feet above the mud-crack horizon appears to indicate the return of normal marine conditions. The relatively fresh or slightly brackish water conditions under which these mud-cracks were formed point toward their development in lagoons near a shore which contributed an abundance of river water to partially land-locked arms of the sea. Such a land must have had a moist climate or at least not an arid one.

Another mud-crack horizon occurs about 100 feet higher in the Ontario Ordovician section at Kingston in the Pamelia limestone. Cushing² has reported this horizon in New York and the writer has described its peculiar features at Kingston.³ Attention is directed to it here because it suggests climatic conditions near the close of Pamelia sedimentation just the opposite of those indicated by the Grenville mud-crack. The flat polygons of the Pamelia mud-crack horizon show features which have been interpreted⁴ as the product of a highly saline condition of the calcareous mud in which they were developed. Sea water would be likely to develop the high degree of salinity represented by the Kingston mud-crack only in an arid climate.

It seems therefore that a relatively arid climate prevailed during late Pamelia time in the lands adjacent to the Ontario sea. This arid climate succeeded a cycle of moist climate in late Chazy time if the inference which has been drawn from the character of the mud-crack is correct.

*Published with the permission of the Director of the Canadian Geological Survey.

¹Kindle, E. M. Some factors affecting the development of mud-cracks. *Journ. Geol.*, vol. 25, 1917, pp. 110-112.

Separation of salt and saline water and mud. *Bull. Geol. Soc. Amer.*, vol. 29, pp. 479-483, 1918.

²Bull. N.Y. State Mus. Nat. Hist. No. 145, p. 76. 1917, pp. 135-144.

³The Ordovician Limestones of the Kingston Area. Rept. of the Ontario Bureau of Mines, vol. 25, pt. 3, p. 8, 1916.

⁴Kindle, E. M. Some factors affecting the development of mud-cracks. *Journ. Geol.*, vol. 25, 1917, pp. 140-142.

BOTRYCHIUM OBLIQUUM MUHL., AND VAR. DISSECTUM (SPRENG.)
NEW TO THE PROVINCE OF QUEBEC.

BY H. MOUSLEY, HATLEY, QUE.

It has been said in one of the handbooks on ferns that if you begin your search for them in March you will hardly be rewarded by finding any but the evergreen species, and even these are not likely to be especially conspicuous at this season. If this is so, what excuse I am going to make for searching for them in December I hardly know except that my enthusiasm for all natural history pursuits knows no bounds, and refuses to be curbed by conventional ideas. I search almost as eagerly for rare Warblers' nests late in the fall as I do in the summer, and having just taken up the study of ferns I was anxious to see whether it was not possible even in the depths of winter to locate and name quite a number by means of their dead and dried fruiting fronds. Now I do not wish to pose as a kind of super-human person, for had not nature in the present instance come to my aid in the shape of a very rapid thaw during the second week in December, I am afraid this paper would never have appeared in print, nor would I have obtained very many evidences of the existence of even dead fruiting fronds, as most of these in the natural order of things would have been buried under a heavy coating of snow, which in these parts is generally in evidence (more or less) for seven months out of the twelve.

However, this winter (1918-19) has been particularly kind and from December 15 to 23 (owing to the afore-mentioned thaw) the fields were practically clear of snow, and the woods had comparatively little in them as compared with other years. This state of things made it possible, therefore, to indulge in winter fern hunting, and for a week I spent a good deal of my time in visiting spots where I had previously noticed some of the large *Osmundas*, *Onocleas* and others, whose fruiting fronds are so very different from the sterile ones, and which as a rule can generally be found even in winter, when there is hardly a vestige of the latter left. During the above week I found the following species and varieties, viz: Maiden hair (*Adiantum pedatum*), Common Brake or Bracken (*Pteris aquilina*), Silvery Speenwort (*Asplenium acrostichoides*), Christmas Fern (*Polystichum acrostichoides*), Marsh Fern (*Aspidium thelypteris*), Crested Shield Fern (*Aspidium cristatum*), Clinton's Wood Fern (*Aspidium cristatum* var. *Clintonianum*), Boott's Shield Fern (*Aspidium Boottii*), Spinulose Wood Fern (*Aspidium spinulosum* var. *intermedium*), Hay-scented Fern (*Dicksonia punctilobula*), Sensitive Fern (*Onoclea sensibilis*), Ostrich Fern (*Onoclea struthiopteris*), Royal Fern (*Osmunda regalis*),

Interrupted Fern (*Osmunda claytoniana*), and last but by no means least the Ternate Grape Fern (*Botrychium obliquum*), and the var. *dissectum*, both of which form the title of this paper.

Little did I think when I set out on the morning of December 21, that I was going to add an additional species and variety to the list of Quebec ferns, yet such was the case, as Mr. J. M. Macoun tells me that there are no records at Ottawa of the two ever having been found in the province before, nor are there any examples in the Herbarium of the Geological Survey from this section of Canada.

Of *B. obliquum*, however, there are examples from two localities in Nova Scotia, and from several around Niagara Falls, whilst of the var. *dissectum* some are from New Brunswick, and some from localities also around Niagara Falls. In Gray's Manual, 7th edition, p. 49, there are several illustrations of the varieties of *B. obliquum*, including one of the var. *dissectum*, and seeing that the species is polymorphous there are no doubt many others yet to be found, so that it is altogether quite an interesting plant and one well worth looking for. As a matter of fact neither of my examples are quite typical, and do not agree exactly either with those from Nova Scotia, New Brunswick or Niagara Falls.

I only found one example of each in a very sheltered spot under a cedar tree on the outskirts of a large wood about two miles to the south of Hatley village, this wood forming part of the farm originally known as the Poole farm, but now belonging to Mr. Will Hunter. The specimens were quite fresh and green when found, and after having been duly pressed and preserved they were subsequently presented to the Herbarium at Ottawa. Of the var. *dissectum*, Gray in his Manual says: "Often found with the typical form in New England," and so I found it here, the two not being more than twelve inches apart from one another, which fact I imagine is all in favor of *dissectum* being pronounced a variety of *B. obliquum* and not a separate species as some are still inclined to consider it I believe.

In conclusion I may say that besides the species already enumerated I had previously found the following additional ones, viz: Long Beech Fern (*Phegopteris polypodioides*), and Oak Fern (*Phegopteris dryopteris*), these two bringing my list up to a total of eighteen, which may be considered very satisfactory, I think, for the amount of time so far spent on the subject.

NOTES AND OBSERVATIONS.

REMARKS ON THE METAMORPHOSIS OF THE SCALLOP (*Pecten tenuicostatus*).—After hatching, the young scallops attach themselves to rocks, scallop shells, or other objects to which they remain as fixtures for a year or two. I can tell this from numerous young specimens obtained which possess an aperture through which a portion of the creature protrudes for attachment, and from a few specimens I came across which possess an elastic byssus for attachment, which protrudes from the so-called foot, and also from the margins of growth, the striations, and other points of structure which undergo a modification.

In the earlier stages the byssal attachment appears to agree with that of *Anomia* throughout the life-history of that genus; that is, there is an aperture near the apex of the under valve through which a portion of the mollusk itself protrudes, so that it is directly attached to the object. But its agreement with *Anomia* in this respect is only temporary, for in time the scallop develops a byssus which is of elastic constituency, such as the mussel (*Mytilus*) possesses throughout its life-history. In the instance of the scallop again this provision is only temporary, for in time as it continues to grow the byssus disappears, and the scallop is free and can then move about by the flapping of its valves.

Sometimes I was able to determine a stage of development from a single example. For instance, the fact that at one time in its life-history the scallop develops an elastic byssus secreted from the foot for attachment to an external object. This I know from only one specimen which had such a byssus. Two other specimens of the same character were obtained, but the byssus of one of them had been broken off in the raking, and it was found lying loose, and the other, a much smaller one, was also detached from the object.

Considering that the byssus always occurs on the same side of the scallop, and that the aperture of the more immature form extends to the margin of the valve, it is evident that the elastic elongation simply evolves from the original attachment, and that the aperture of the under valve as it becomes obliterated, leaves the scallop, except that it is now moored to an external object, otherwise free.

Judging from an illustration from Parker and Haswell, these zoologists seem to regard the pectens as hermaphrodite, as they show one part of the gonad in the same individual as male and the other as female. But this is not so, at least in the case of the scallop. The sexes are distinct, and out of 209 scallops specially examined by me in my observational work, 100 were males, 108 females, and in

one the sex was indeterminable. The gonad of this last mentioned was completely empty, not that I consider the scallop had spawned, for it was impoverished generally, and apparently in a sickly condition. I might have been able, had I known it at the time, to determine the sex by the digestive organs, but this was a later discovery. This fact, however, helps to emphasize what I say as to the sexes being distinct. The gonad of the male is cream-colored and the stomach and its appendages gray, whereas the gonad of the female is a sort of brick-red color and the stomach and its appendages brown.

ANDREW HALKETT.

A ROBIN'S MISTAKE.—A pair of robins have for some years been in the habit of building their nest among the creepers which grow on the side of my house, having for neighbors a pair of crow blackbirds. This year the two nests were placed on either side of a bay window, only a couple of yards apart. Both young families left the nest at about the same time, and this circumstance evidently led to complications. The parent crow blackbirds showed no lack of interest in their young family. On the contrary, for the first day or two after the latter left the nest the old birds resented the appearance of anyone on the lawn where the young were, complaining loudly and making savage darts at the intruder, as though intending to do him grievous bodily harm. Nevertheless, in spite of all this parental solicitude, one of the young crow blackbirds was adopted by one of the parent robins. How it originally came about I do not know; but a few days later, when all of the other members of both families had disappeared, I was attracted by the novel sight of the robin working industriously early and late to satisfy the voracious appetite of his adopted progeny, who followed him about continually demanding more. This proceeding continued for about three weeks and as the pair remained all that time in my garden, I was able to keep close watch on them and to note the gradual growth of the young blackbird, until when I last saw them he was fully plumed and almost indistinguishable from an adult. There was, therefore, no doubt whatever as to the correctness of the identification. It was not, as some might be inclined to suggest, a cow bird, but unquestionably a crow blackbird. Once, on the second or third day of my observations a pair of adult crow blackbirds—possibly the real parents—arrived on the scene and for a time evinced considerable excitement over their "lost heir," but as the latter took

no notice of them whatever, but stuck to the robin and as he, poor bird, was much too busy hunting worms to notice anything else, the blackbirds presently calmed down and flew away, no doubt concluding that it must be a case of mistaken identity.

Has any reader of *THE FIELD-NATURALIST* ever heard of such a curious mix-up as this? It is, I suppose, just possible that the explanation may be that a crow blackbird's egg was laid in the robin's nest. The nest was so situated close to the glass of a window that one could look into it quite easily from one of the rooms of my house. Nevertheless

I did not examine it until the eggs were hatched, and then only very cursorally. It is, therefore, possible, though I think unlikely, that the young crow blackbird was in the nest and escaped my notice. Naturally I was not expecting that any question would arise as to the identity of the young robins. Still I think the more likely explanation to be that by some curious chance the robin accidentally adopted one of his neighbor's children soon after the two families had simultaneously left their respective nests.

W. L. SCOTT.

Tredinnock, Ottawa.

BOOK NOTICES AND REVIEWS.

THE BIRDS OF MIDDLE AND NORTH AMERICA. By Robt. Ridgway, Part VIII, Continuation of Bulletin 50, U.S. National Museum, Washington, Government Printing Office, 1919.

The monumental task of monographing all the birds of North and Middle America was begun by this veteran ornithologist, now probably the Dean of the science in America, many years ago. The first volume covering the Finches and Sparrows appeared in October, 1901. Since then the following parts have appeared. The contents covering Canadian species only is given here.

Part II, 1902, The Tanagers, Troupials (blackbird and orioles) and Wood Warblers.

Part III, 1904, Pipits, Swallows, Waxwings, Vireos, Shrikes, Crows and Jays; Titmice, Nuthatches, Creepers, Wrens, and Dippers.

Part IV, 1907, Thrushes, Mockingbirds, Starlings, Larks and Tyrant Flycatchers.

Part V, 1911, Hummingbirds and Swifts.

Part VI, 1914, Woodpeckers, Kingfishers, Goat-suckers, and the Barn and Eared Owls.

Part VII, 1916, Cuckoos and Pigeons.

This present volume now appearing includes Oyster-catchers, Turnstones, Surf Birds, Plovers, Snipes, Phalaropes, Avocets, Skimmers, Terns, Gulls, Skuas and Auks.

The next Part, namely IX, now in course of preparation, will contain Cranes, Rails, Gallinules and Coots; Turkeys, American Partridge, Grouse, Falcens, Hawks and Eagles and American Vultures.

It is contemplated that Part X will complete the work.

The magnitude of this work can be partially appreciated by the fact that each volume runs from 550 to 875 closely printed pages, many of them consisting of masses of abbreviated bibliographical references and synonymy requiring immense research and exact transcription and proofreading. Dr. Elliott Coues said that bibliography required the work of an "inspired idiot." On these grounds alone the

Birds of Middle and North America would be notable, but as each species and subspecies is accompanied by the fullest detailed description and each has been subjected to the strictest scrutiny as to taxonomic standing and relationship by one of the keenest observers in America it is evident that this will stand as a monument to the author for many years. It will be noted that the classification does not follow that of the A.O.U. Check list and is not familiar to the majority of American ornithologists. In this it probably shows a considerable step in advance. The latter is acknowledged to be faulty, but it has not been thought expedient to change it until a system can be presented that will meet a more general approval than any hitherto advanced receives. The work is not popular, but confines itself to strictly scientific aspects of taxonomy, nomenclature, identification and distribution. The purely popular nature student has little interest in it except as a reservoir of ascertained facts to guide, control and direct his esthetic impressions and investigations.

P. A. TAVERNER.

HAMILTON M. LAING. Whilst it is not the custom to treat newspapers as serious scientific publications it seems that some attention should be called to the series of excellent articles on popular ornithology appearing more or less regularly in the *Toronto Globe*. These are from the pen of Hamilton M. Laing, who is taking the place of the late lamented Sam Woods who conducted this nature column with but scanty recognition for a long period. Mr. Laing is a Canadian, of considerable experience in Manitoba, now resident in Portland, Oregon. During the latter days of the war he was in the aviation corps and assisted in training many of our fliers who later made a good account of themselves at the front.

The subject of these papers cover such a range of subjects as "The Shore Birds in Autumn,"

"Hawks Everyone Should Know," "The Wood Warblers," etc. The subjects are treated in a popular, entertaining manner, in a style that more than occasionally warrants the term "fine writing", sympathetically but with an absence of gush and with a good substratum of personal knowledge and common sense. We can stand many more of such popular science writers in Canada as well as elsewhere.

P. A. TAVERNER.

In the *Auk* for April, 1919, appears the following titles of especial interest to Canadians:

WINTER ROBINS IN NOVA SCOTIA, by Harrison F. Lewis, pp. 205-217. This records the unusual appearance of robins in widely separated localities of Nova Scotia, in late December, January, February and early March. The interesting point brought out is that the number of robins increased during the season of greatest cold, culminating in early February in weather below zero and disappearing when the temperature moderated. It is suggested that these winter visitors are not unseasonably early migrants from the south, but a collection of winter lingerers from the north or interior gathered together by the unusual inclement weather.

PROBLEMS SUGGESTED BY NESTS OF WABBLERS OF THE GENUS *Dendroica*, by John Tredwell Nichols, pp. 225-228, raises some interesting questions as to the nest-building instinct and the facility or otherwise with which birds substitute new materials of civilization for their ancestral supplies.

ON THE POPULAR NAMES OF BIRDS, by Ernest Thompson Seton, pp. 229-235, is a plea for more characteristic common names for birds, advocating terms of spontaneous and natural origin over those of more clumsy manufacture.

THE REALITY OF SPECIES, by Leverett Mills Loomis, pp. 235-237. This is a short paper discussing the subspecies question. The conclusion of the author (quite in harmony with the ideas of this reviewer) is that whilst the species with its component races is a reality, the lesser subspecific subdivision is but a concept.

GEOGRAPHICAL VARIATIONS IN THE BLACK-THROATED LOONS, by A. C. Bent, pp. 238-242. This is a brief discussion of the occurrence of these allied species in America. The writer lumps four forms *Gavia arctica*, the Black-throated Loon, *G. pacifica*, the Pacific Loon, *G. viridigularis*, the lately described Green-throated Loon, and *G. suschkini*, the Asiatic form, in one species as geographical races of *G. arctica*. *Pacifica* appears to be the common North American form with *viridigularis* of erratic occurrence on the Pacific coast. He questions the specific, even the subspecific dis-

inction of this form as he can limit it to no geographical range. It does not appear that true *G. a. arctica*, in spite of repeated records to the contrary, has even been satisfactorily recorded from America.

REASONS FOR DISCARDING A PROPOSED RACE OF THE GLAUCUS GULL (*Larus hyperboreus*) by Johnathan Dwight, pp. 242-248. In this paper Dr. Dwight brings his keen analytical pen to bear on H. C. Oberholser's proposal (*Auk*, 1918, p. 472) to recognize the rejected northwestern American form *Larus barrovianus* as a subspecies of the Glaucus Gull. By a series of graphic diagrams he shows that the size distinctions upon which the form is based are too variable for recognition, further driving his argument home by superimposed outlines of the average bills of the two supposed races in which the distinction of size is shown to be absurdly small. In conclusion, he says:

"In our gropings after the truth it is wasteful of too much time to spend so much of it stumbling over names of groups so poorly defined that they convey only a vague meaning to a few specialists and none at all to everybody else. Decking the subspecies in all the glittering panoply of diagnosis, dimensions and distribution makes it an impressive spectacle, but this does not necessarily make of it a good subspecies."

These are sentiments of which the reviewer heartily approves.

THE BIRDS OF RED DEER RIVER, by P. A. Taverner, pp. 248-265. This is the last half of a paper begun in a previous number. Including an addenda it brings the number of species annotated to 194.

FOURTH ANNUAL LIST OF PROPOSED CHANGES IN THE A. O. U. CHECK LIST OF NORTH AMERICAN BIRDS by Harry C. Oberholser, pp. 266-273. In this are gathered together all the various proposals of the past year that may affect American Ornithological nomenclature. It deals with about seventy-two names. Without doubt some of these will be accepted according to the canons of our Code of Nomenclature, but it is a matter of some congratulation to us that this lengthy list is one of mere proposal and not accepted fact. These late lists of proposals show that the genus splitter is in full action. It is to be hoped that the committee on nomenclature will bear in mind that the genera is but a conception adopted for convenience and that it defeats its own end when each genus approaches the monospecific and in place of simplifying our system but adds to its complexity.

Under General Notes, Harry C. Oberholser, pp. 282-283, in Status of the Generic Name *Archibuteo* decides that *Archibuteo* is a *nomen nudum* and therefore untenable and that the next name applicable for the genus of the Rough-legged Hawks is

Triorchis Kaup. This would change the accepted name of both our Roughlegs.

In the Division of Correspondence, P. A. Taverner writes urging that caution be used in identifying birds subspecifically by either geography or slight characters alone advocating, except where the case is clear or indisputable, that the specific binomial be used leaving subspecific status open until such times as more evidence is available. This is replied to by Witmer Stone, the editor, with a qualified assent, but advancing a negative argument that the present reviewer (the author of the original letter) regards as dodging the question.

Information of peculiar interest to us is the report upon the J. H. Fleming, Toronto, Ontario, collection of birds, on page 321, which is also copied by the *Ibis* for July. It reads:

"This is one of the largest private collections and covers the birds of the entire world—a most commendable feature. We learn that it comprises about 25,000 specimens representing 5,377 species and 1,925 genera, as recognized in Sharpe's Hand List.' When we note that there are, according to this authority, some 17,000 species of birds and 2,647 genera, we realize that Mr. Fleming has about one-third of the known species and three-fourths of the genera represented, the latter being evidence of the painstaking care that he has exercised in bringing together this notable series of specimens."

This is one of the really notable private collections in English-speaking America; in some directions, as in the thoroughness with which it covers its broad field, equalling or even outranking those of the larger American museums.

The gathering of this monumental series has been results of a life time and if the future Canadian student of ornithology in its broader aspects, finds the working tools for his investigations within this Dominion it will be entirely due to Mr. Fleming's efforts.

This is by far the largest collection of birds in Canada, outranking even in mere point of numbers its nearest rival, that of the Museum of the Geological Survey at Ottawa, representing the Dominion Government's national collections, which though practically confined to the Canadian field, numbers barely 14,000 specimens. Whilst these figures may seem large to the uninitiated they are really small in comparison with the more notable collections abroad. There are a number of private collections in the United States ranging in the neighborhood of 60,000. The collection of the United States National Museum, a comparable institution to ours, has, exclusive of large collections of the Biological Survey which are practically amalgamated with it,

reached 200,000, whilst the British Museum bird collections passed the half-million milestone ten years ago. These comparative figures are merely given here to indicate that while Canada may be congratulated on having made a healthy start in this branch of scientific investigation, she has still a long way to go before she can compete on a par with other countries which have had a longer start in the field of zoological research.

P. A. TAVERNER.

WILD ANIMALS OF GLACIER NATIONAL PARK. *The Mammals*, with notes on Physiography and Life Zones, by Vernon Bailey, Chief Field Naturalist, Bureau of Biological Survey, Department of Agriculture. *The Birds*, by Florence Merriam Bailey, author of Handbook of Birds of the Western United States. Dept. of the Interior, Franklin K. Lane, Secretary. National Park Service, Stephen T. Mather, Director. Washington: Government Printing Office, 1918. (Pp. 1-210, with 21 halftone plates of mammals and 16 of birds, 18 text figures of mammals, and 78 of birds. Copies may be procured from the Superintendent of Documents, Government Printing Office, Washington, D.C., at 50 cents per copy).

Glacier National Park lies in northwestern Montana, along the main range of the Rocky Mountains, the "Continental Divide," from the Canadian boundary, where it adjoins one of our own Canadian national parks, the Waterton Lakes Park, on the north, to the line of the Great Northern Railway on the south. Glacier Park, though one of the more recently established United States parks, is rapidly becoming famous as a region of great scenic beauty, celebrated by painters and photographic artists. The present volume is a praiseworthy effort of the United States park management, during the recent turning of the movement of vacation tourists to "See America First," resulting in many new visitors to the national parks, to set forth some of the less known natural advantages of these great national playgrounds to a large and constantly growing class of people. The scenic mountain-peaks, icy glaciers, and mirroring lakes scarcely need to be pointed out, but other fascinating possibilities are not so obvious. Interest in wild life is growing everywhere, and nothing adds to the interest of our parks more than glimpses of animated life. A few squirrels or sprightly chipmunks obviously add a touch of life even to a city park, and a sight of the picturesque and rapidly disappearing large game animals of the Rockies in their native habitat is worth going far to see. Soon the parks may be the only place where we shall have this privilege.

Glacier Park has a wonderful natural variety of plants and animals, containing within its boundaries areas ranging from the lower Transition Zone of its open plains borders, through the dense forests of lodgepole pine, spruce and fir in the Canadian Zone at the base of the mountains, the narrow belt of dwarfed timber at or near timberline in the Hudsonian Zone, and the Arctic-Alpine Zone of the higher mountain-tops. Mr. Bailey has sketched briefly the botanical wealth of these varied climatic and life zones, but the book deals mainly with mammals and birds, and no one is better qualified to treat them than Mr. Bailey with his lifetime of experience in field work in the West, accompanied on many trips by the accomplished "bird woman" who is his wife. While the book is of aid to every beginning naturalist or enquiring tourist who may visit the region, it will prove useful as a Baedeker for the most expert, telling him where the species he is most interested in may be found at the proper time. A good assortment of interesting life-history notes on each species is given, with suggestions of many things which may be of value for succeeding visitors to the park to watch for and add to our knowledge. Most of the mammals are illustrated by photographs from life. The bird section is well illustrated by new life photographs from various sources, and well-selected reproductions of photographs, sketches, and paintings which have been used in other publications. A systematic key is given for the classification of the commoner summer birds of the park which will be useful in other

places in the northern Rockies.

In addition to the pleasure and profit which this book gives to a person already interested in natural history, and its value as a strictly biological report, its chief value will probably lie in introducing the fascinating possibilities of wild life study to the average citizen, the casual tourist and park visitor, whose numbers are increasing from year to year. When this interest is developed, and the parks need only be entered and intelligent attention called to their advantages for the interest to be kindled, a new force is added to the protection of wild life, rational conservation, and public recreation, the influence of which can not be overestimated.

The Canadian National Parks offer similar if not greater possibilities. Waterton Lakes Park (just north of Glacier Park), Rocky Mountains Park at Banff, Jasper Park in Alberta, Point Pelee Park in Ontario (the most southerly point in Canada, on the great migratory bird route along the shore of Lake Erie) and the Percé and Bonaventure reservation for the protection of the great seabird rookeries at the tip of the Gaspé peninsula of Quebec, have their own peculiar attractions to the nature lover, and are bound to be still more attractive when their wild life attractions are more generally known to the public. For such areas, the little books which teach the eye to know what it sees, as well as to notice what is often hidden to the unseeing eye, have an increasing function in popular education.

R. M. ANDERSON.





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CHAMPLAIN'S ASTROLABE.

BY CHARLES MACNAMARA, ARNPRIOR, ONTARIO.

The astrolabe was an instrument for measuring the altitude and relative positions of heavenly bodies. It was probably invented by those eminent astronomers of antiquity, the Chaldeans; at any rate it was well known to the Greeks and Orientals long before Christ. Essentially it consisted of a graduated circle, across the diameter of which was a moveable bar, pivoted at the centre. In use the instrument was hung plumb, and the body whose altitude it was desired to ascertain, was sighted along the bar, the angle above the horizon being read on a scale at the edge of the circle. The name of the instrument, derived from the Greek, may be translated as "star-taker."

The astrolabe gradually developed into two different types: a large stationary spherical apparatus that was the chief instrument in observatories even into the 17th century, and a small circular model that could be conveniently carried by travellers. This portable type was often richly ornamented, and engraved with elaborate graduations and scales, but about 1480 a simple form was designed for the use of mariners, and it was apparently this model that Columbus used on his voyages of discovery. It proved, however, an awkward instrument on a pitching vessel, and shipmen generally seem to have preferred another device known as the cross-staff. Nevertheless, the astrolabe continued in use until well into the 18th century, when it was displaced by the quadrant.

In 1867 an astrolabe was found near Cobden, Ontario, on the old portage route which cuts off the great elbow that the Ottawa river makes to the north between its expanses known as Allumette lake and Lac des Chats; and as first noticed by the late A. J. Russell of Ottawa, in a pamphlet published in 1879, evidence points strongly to the instrument having been lost by Champlain on his journey up the Ottawa in 1613, more than 250 years before.

Champlain was induced to undertake this expedition by the lying story of one Nicholas de Vignau, whom he had entrusted with some minor explorations in Canada, and who had spent a winter with the natives there. On de Vignau's return

to France in 1612, he told Champlain a wonderful tale of how he had reached the North Sea by way of the River of the Algonquins—otherwise, the Ottawa. One could travel, de Vignau said, from the Falls of St. Louis (Lachine) to this sea and back again in 17 days; and he amplified his story by asserting that he had seen the wreck of an English ship on the shore, and that the Indians there could show the scalps of the crew of 80 men that they had killed, sparing only one English boy whom they were keeping for Champlain.

Deceived by this fabrication—to which de Vignau actually made affidavit before two notaries at La Rochelle—Champlain, on Monday, the 27th May, 1613, to the sound of a parting salute from his ships, set out with five companions from Isle Ste. Hélène (opposite the present city of Montreal) to seek the mythical sea. The party travelled in two canoes, and at starting consisted of Champlain, de Vignau and three other Frenchmen with one Indian; but later on one of the Frenchmen was sent back and a second Indian took his place.

A saying of the late Mr. Lindsay Russell, one time Surveyor General of Canada, was that "a multiplicity of apparatus is the hall-mark of the amateur." Champlain was an old experienced traveller, to whom voyages of discovery had become so much a matter of course that his journals never make any particular mention of his equipment, and we may be sure that he carried no "multiplicity of apparatus." But he certainly must have been provided with an astrolabe, for at three different places along his route he took observations for latitude. The first was near the foot of Lake St. Louis on the St. Lawrence, the position of which he gives as $45^{\circ} 18'$. Considering the crudeness of his instrument, his observation was remarkably accurate, for the correct latitude is about $45^{\circ} 25'$.

In these days of swift and luxurious travel, it is interesting to note that it took the explorer eight days to cover the distance between Montreal and Ottawa; and that on the way he was nearly drowned in the Long Sault rapids. Thus, he reached the Chaudière Falls on the 4th of

June, and after determining the latitude of the portage on the Hull side as $45^{\circ} 38'$ (actually $45^{\circ} 26'$) he proceeded up Lake Deschênes the same day. The barren Eardley hills on the one side and the sandy shores of Constant Bay on the other gave him a poor opinion of the surrounding country, and he puts it down as "very unpromising." The party passed the night "on a very pleasant island"—doubtless Mohr island—and on the 5th June they portaged at the Chats falls and paddled up Lac des Chats. Champlain speaks of the Madawaska river as a tributary at this point, but says nothing of the Mississippi or the Bonnechère. His remark that "the lands about the before-mentioned lake are sandy" shows that he must have gone up by the Quebec shore, and was struck by the long arid stretches of Kilroy's bay and Norway bay. In Lac des Chats they camped as usual on an island, evidently for safety, as the Algonquins were always desperately afraid of a surprise attack by the Iroquois. On this island Champlain recounts that he "saw a number of fine red cypress [cedars] the first I had seen in this country, out of which I made a cross, which I planted at one end of the island on an elevated and conspicuous spot, with the arms of France, as I had done in other places where we had stopped. I called this island Sainte Croix." Red cedar has been extinct for many years on Lac des Chats, and there is no island in the lake with any marked elevation on it, so it is impossible to identify Holy Cross island with any certainty; but probably it is one of the Braeside islands, or perhaps the island opposite Norway bay.

Next day, Thursday, 6th June, they ascended the Chenaux rapids to within about a mile of the present village of Portage du Fort, and landed on the Ontario side at a point known in after years as Gould's Landing. Champlain took the latitude of this place and says he found it $46^{\circ} 40'$. In reality the place is about $45^{\circ} 34'$; and in some way he had made a mistake of a degree in his calculation. "Here," Champlain says, "our savages left the sacks containing their provisions and their less necessary articles in order to be lighter for going over-land and avoiding several falls which it was necessary to pass." And here de Vignau, who must have been contemplating the approaching exposure of his falsehood with ever increasing anxiety, tried to persuade Champlain that the best route was up the Ottawa, his hope, evident in the sequel, being that the long succession of rapids above Portage du Fort would bring disaster on the expedition, or at least discourage Champlain and cause him to turn back. But "our savages said to him, you are tired of living, and to me that I ought not to believe him, and that he did not tell the truth." Convinced

that the Indians knew the best way, Champlain took their advice, and the party climbed to the higher land above the river, and travelled southward a couple of miles to the first of a chain of long narrow lakes that lie across the base of the large peninsula formed by the great swing of the Ottawa river towards the north. Until railways extended into this part of Ontario in the seventies of the last century, the route here followed by Champlain was still the principal road to the upper Ottawa. Steamboats plied on Lac des Chats from the head of the Chats rapids to Gould's Landing, and thence travellers were conveyed by stage to Muskrat lake where they embarked on a steamboat that carried them to within a few miles of Pembroke.

This was the longest and hardest portage the expedition had struck yet. Champlain himself carried three arquebuses and three paddles, his cloak and "some small articles," among which it is safe to say was the famous astrolabe. The others, he says "were somewhat more heavily loaded, but more troubled by the mosquitoes than by their loads." They passed through the string of four small lakes, the first three of which are known as Coldingham, Town and Catherine, the fourth being apparently nameless, and stopped for the night on the shore of the more important Olmsted lake.

"Nous nous reposâmes sur le bord d'un estang qui estoit assez agreable, & fîmes du feu pour chasser les mousquites, qui nous molestoient fort, l'importunite desquels est si estrange, qu'il est impossible d'en pouvoir faire la descriptio." Thus Champlain: If he returned to-day, he would see many and astounding changes in the country he discovered; but among all that was new and wonderful, he would again find in the month of June the same old mosquitoes, the importunity of which is as extraordinary as ever.

In the morning (Friday, June 7th), they paddled down Olmsted lake, and on foot crossed the three miles or so of country that separates it from Muskrat lake, as the connecting streams are not navigable even by a bark canoe. A small lake about a mile long, now called by the popular name of Green lake, lay in their way, and although Champlain does not mention it, it is very likely that the Indians were glad to take advantage of even such a short piece of water as this in their long portage. It was on the right bank of the small stream flowing out of Green lake, and some 200 yards from the foot of the lake, that the astrolabe was found. Somewhere between Olmsted lake and Muskrat lake, Champlain and his men encountered what foresters know as a windfall. The thick growth of pines had been blown down by a tornado, and it was with great difficulty that the party made their way

"now over now under these trees." The ways in which the astrolabe may have been lost are of course numberless, but there is at least a strong probability that this windfall occurred around Green lake, and that in climbing through the confusion of trees, the instrument was dropped unnoticed in the tangle.

Near Muskrat lake they found a settlement of Indians who received them kindly, and fitted out

what sterile soil. Neither the site of this village nor the extensive cemetery nearby, described at length by Champlain, has ever been discovered. A rich find awaits some lucky archeologist on Allumette island.

For our present purpose it is important to notice what Champlain says about the latitude of this place. The text of the 1632 edition of his journal reads: "Elle est par les 47 degrez." In "Voyages of



Champlain's Astrolabe; actual size is 5 $\frac{5}{8}$ in. in diameter. From photograph kindly supplied by Mr. Samuel V. Hoffman.

two canoes to convey them on their way. From the foot of the lake they portaged once more, this time to the Ottawa, where they were met by the Chief Tessouat, and with him crossed to Allumette island. Protected by the long portages and numerous rapids, the Algonquins, feeling comparatively safe from the dread Iroquois, had established here a considerable village of wigwams and were cultivating the some-

Samuel de Champlain," edited by W. L. Grant (New York, 1907), the translator, missing the point of this expression, renders it simply as: "It is in latitude 47°." The real meaning of the phrase is perhaps best expressed in colloquial form: "It is somewhere around 47 degrees." Champlain says nothing of the loss of his astrolabe, but it is clear that he made no observation here—presumably be-

cause he was without the means—and merely estimated the position by dead reckoning from his last observation at Gould's Landing.

And now the fatal hour for de Vignau had come. His story of the North Sea seems to have been suggested by some vague report he had heard of English explorations in Hudson's Bay. But he knew nothing about Hudson's Bay, and in order to give his imaginary sea a local habitation and a name, he connected it with Lake Nipissing, which he had no doubt heard spoken of by his Indian hosts as a large body of water not many days' journey distant. Thus Champlain was led to ask Tessouat

raised loud cries, and Tessouat said: "You are a downright liar, you know well that you slept at my side every night with my children; if you were among the people mentioned it was while sleeping."

For a while the impostor brazened it out, but at last gave in and made full confession. "After meditating by himself he fell on his knees, and asked my pardon, declaring that all he had said both in France and in this country in respect to the sea in question was false, that he had never seen it, and that he had never gone farther than the village of Tessouat." His anxiety to return to Canada, he said, had caused him to concoct the story—Cana-



Green lake, near Cobden, Ont.; outlet flows through rushes at lower right-hand corner.

for canoes and men to visit the "Nebicerine" (Nipissings).

At first agreeing very reluctantly—for they were not on good terms with the Nipissings—at a later council the Indians decided that the road was too hard and dangerous, and refused to go. To overcome these objections, Champlain pointed to de Vignau as a young man who had travelled to the Nipissings without encountering such great difficulties or finding the people so unfriendly. Astonished, Tessouat asked: "Nicholas, is it true that you say you were among the Nebicerine?" It was long before de Vignau answered; then he said hesitatingly: "Yes, I was there." At this the Indians

will forgive him a little for the implied compliment to their country—and he trusted to the hardships and hindrances of the road to turn Champlain back before the lie was discovered.

The Indians were greatly pleased that de Vignau's avowals had vindicated them, but they tried to wreak vengeance on the wretched liar. "Give him to us, and we promise you that he shall not lie any more," they cried, and all set after him shouting—"their children shouting still more." But Champlain, to clear himself of the failure of the expedition, desired to have the impostor repeat his confession before the Frenchmen at the ships, and so he saved de Vignau from the wrath of the savages.

Regretting the waste of time and the hardships endured to no purpose, but patient under his disappointment, Champlain started on his return journey on the 10th June, accompanied by forty canoes, which number was later increased to eighty by accession of parties along the way, all eager to trade their furs at the Falls of St. Louis for the wonderful wares of the white man. Champlain did not recross the Muskrat lake portage, but ran the rapids down the main stream. At the Chaudière the Indians threw an offering of tobacco into the falls with appropriate ceremony, "by which means they are ensured protection against their enemies, that other-

to do with him, and Champlain says: "As for our liar, none of the savages wanted him, notwithstanding my request to them to take him, and we left him to the mercy of God." And so de Vignau disappears from history.

Anyway his troubles were all over when our story begins again after an interval of 254 years. From 1613 we jump to 1867, in which year John Lee, a farmer living in the Township of Ross, near Cobden, Ontario, took a job of clearing land for Captain Overman, of the *Jason Gould*, the Ottawa Forwarding Company's steamboat on Muskrat lake. Captain Overman had located lot 12 in the second



Stream from Green lake flows through alders on the right. Astrolabe was found near where figure is standing.

wise misfortune would befall them." But in his heart, man has seldom any real faith in a propitiatory sacrifice—the gods are not so easy to turn aside—and in spite of this solemn rite, several times the Indians were thrown into a panic at night by false alarms of an Iroquois attack.

Arrived at the ships on the 17th June, Champlain called his chief men together, and had de Vignau "make declaration of his maliciousness" before them. The wretch pleaded hard for forgiveness, "and in view of certain considerations" Champlain pardoned him. The subsequent fate of the impostor is not on record. The French would have nothing

concession of Ross, about two miles from the town of Cobden; and it was here that the astrolabe we must attribute to Champlain, was found in August, 1867, by John Lee's son, Edward George, at that time a boy of 14 years, and now a well known resident of the third line of Fitzroy, a few miles from Arnprior. How he discovered the astrolabe cannot be better told than in Mr. Lee's own words, as he related it to me in August last:

"One day we were working just below Green lake in a bush of mixed hardwood and pine. I don't remember the number of the lot now, but it was afterwards occupied by John Sammen, father

of Mr. Sammon, of the Copeland House, Pembroke. When noon came, pa sent me home for his dinner, and when I got back with it he sat down to eat it, while I went on drawing the logs with our team of oxen, Buck and Brin, to the heaps where they were being burned. We burned timber those times that would make a man's fortune now-a-days. There was an old fallen red pine that lay downhill with its top in the little creek that comes out of Green lake. Pa had chopped the trunk of this tree into three logs, and I drew two of them away with the oxen, but the third log, just below the branches was not chopped clean off, and I hitched the oxen to it and pulled it around sideways so as to break it off. I had to dig away the moss and marl that the old tree lay in so as to get the chain around the log, and when the log swung around it rolled back the moss like a blanket, and there on the ground I saw a round yellow thing, nine or ten inches across, with figures on it, and an arm across it, pointed at one end and blunt at the other. Alongside of it was a lump of rust that might have been chains or something like that, but I did not pick it up. I showed the compass to pa, and he put it on a stump a little way up the hill. Just then Captain Roverman (sic) came along to see how the work was going, and old Captain Cowley was with him. Pa showed them the compass and they took it away, and pa said they promised to give me \$10.00 for it, but I never got a farthing nor saw hide or hair of the compass since. Poor pa let them have it, but if I had got it up to the house, ma would not have give it to them that easy. The compass was lying about two or three rods from the edge of the creek. I never saw water enough in creek to float a canoe."

Considering that it was more than fifty years since Mr. Lee had found the astrolabe and that he had never seen it or any reproduction of it since, his description of the instrument, while not quite correct, is remarkably close to the reality, and does great credit to his memory, as well as giving his story the undoubted stamp of truth. It will be noticed that as a plain man making no pretence to book learning, Mr. Lee never ventures on the name "astrolabe," but always speaks of the instrument as a "compass." Sometimes in conversation, with a real feeling for style, to avoid iteration, he refers to it as "the item."

Captain Overman eventually gave the astrolabe to Mr. R. W. Cassels, of Toronto, president of the Ottawa Forwarding Company, but this priceless relic of the founder of Canada was so lightly appreciated by Canadians that it was permitted to leave the country, and in 1901 an American connoisseur, Mr.

Samuel V. Hoffman, of New York, added it to his large collection of astrolabes. It is still in Mr. Hoffman's possession, and to him I am much indebted for the photograph of it illustrating this article.

In comparison with the exquisitely finished instruments of precision carried by the modern explorer, Champlain's astrolabe is a very rough production. A careful description of it is given by Russell in his pamphlet already referred to. The instrument, which has the date 1603 engraved on it near the bottom, is of brass, and is of $5\frac{3}{8}$ inches diameter. The metal is $\frac{1}{8}$ inch thick at the top and increases to $\frac{3}{8}$ inch at the bottom, the extra weight below being intended to give steadiness in use. A ring at the bottom, to which, Russell surmises, a weight was to be hung for additional stability on shipboard, was accidentally broken off before the astrolabe came into Mr. Hoffman's hands. The suspension ring at the top has a double hinge to ensure the instrument hanging plumb. (The fine statue of Champlain in Major's Hill Park, Ottawa, shows the great explorer holding his astrolabe upright in his hand, but this is an artistic license; in making an observation, the instrument was held suspended from the top.) The circle is divided into single degrees, and it was possible, as Champlain's observations prove, to determine latitude by aid of the instrument to within 15 minutes of a degree or even less.

Last October under Mr. Lee's guidance, I visited the place where the astrolabe was picked up. Lee had not been there for many years, yet he had no difficulty in finding the place, and the surroundings agreed accurately with the description he had given me two months before. Naturally, tremendous changes have taken place in the 300 years since Champlain and his men, heavily laden, "et plus greuez de mousquites que de leur charge," forced their way through the primeval woods. The sombre pine forest that then rolled unbroken over the ridges and valleys has long disappeared, and the somewhat hilly land is now laid out in well cultivated farms with clumps of hardwood bush here and there. Hardwoods grow to the water's edge around Green lake, except at its foot, where there are some old farm buildings, and a large sloping field, along the bottom of which the small stream that issues from the lake flows through alders and poplars. It was on the right bank of this "creek" a few yards from the water, and about 200 yards below the lake, that Lee found the astrolabe in the moss. There is no prominent object in the landscape to mark the exact spot, and where the instrument lay is now cultivated ground. But

to fix the position as nearly as may be, it should be noted that the slope of the field becomes a little steeper just here and forms a slight shoulder, and the stream begins a small deviation towards the south. The stream is not nearly large enough to navigate a canoe, and there is nothing to show that it was ever any larger. But its valley leads in an approximately direct line to Muskrat lake, and there is no doubt that Champlain and his party portaged

along it both for the guidance of the flowing water and because it was their shortest road.

In the preparation of this article I have to thank Mr. A. F. Hunter, secretary of the Ontario Historical Society, for bibliographical references and other assistance; and I am also under obligation to Mr. L. P. Sylvain, of the Library of Parliament, Ottawa, for ready permission to consult the Government's rare Canadiana.

BIRDS OF NORTHERN SASKATCHEWAN AND NORTHERN MANITOBA COLLECTED IN 1914 BY CAPT. ANGUS BUCHANAN.

By J. H. FLEMING.

Almost the first knowledge we have of the ornithology of the Saskatchewan region is contained in a series of papers published in the *Ibis* of 1861-62-63, by Capt. Blakiston, who spent the winter of 1857-58 at Fort Carlton, on the Saskatchewan river, and in 1858 collected at various points in what is now the Province of Saskatchewan. In these papers Capt. Blakiston incorporated much information from Vol. II of the *Fauna Boreali-Americana* of Richardson and Swainson, and other published sources. Since then our knowledge of the birds of southern Saskatchewan has been constantly enlarged, but strangely enough the ornithology of the great region drained by the Churchill river and lying to the north of what was till 1912 the northern boundary of the province, has had little or no attention paid to it. Notes on its birds were made by James M. Macoun, who in 1888 travelled from Lesser Slave lake east by way of the Athabasca and Churchill rivers to Lake Winnipeg; these notes were eventually published by John Macoun in his "Catalogue of Canadian Birds." Less than a dozen birds are in the U.S. National Museum collected at Du Brochet lake in 1890, and Pelican Narrows in the Churchill river in 1891; probably collected by Henry MacKay, and Joseph Hourston for Roderick MacFarlane; these are the only skins I have seen from this region taken before 1914. During the years 1892-93-94, J. Burr Tyrrell in the course of his explorations of the Barren Grounds more than once traversed the Churchill river, and his official reports¹ contain the best description we have of this region; in these reports there are short references to birds. When Edward A. Preble wrote his great report on the Natural History of the Athabasca-Mackenzie region² he included all that

was known of the birds of the Churchill river up to 1908.

When the boundaries of Saskatchewan were, in 1912, extended north to include a part of the old Northwest Territory, so little was known by the Provincial Government of the natural history of the northern part of the country that Angus Buchanan determined to investigate the country lying between the Saskatchewan river and the Barren Grounds. He left Prince Albert on May 6, 1914, and descended the Beaver river to Lake Ile-à-la-Crosse, and the Churchill river, thence continuing upstream on Reindeer river, and Reindeer lake, entering the Cochrane river on July 18, and Lake Du Brochet on August 1. His base camp was made north of this lake, and here he proposed to winter, but hearing of the outbreak of the war in late October, he decided to return, reaching Regina on January 15, 1915, after an absence of eight and a half months, during which he travelled nearly two thousand miles by canoe and dog-sleigh. The birds collected during this expedition were divided, part were deposited in the Provincial Museum at Regina, and the rest handed over to me; they form a very important addition to our knowledge of the birds of the region drained by the Churchill river, and are in fact the first collection made in northern Saskatchewan.

After making a short report³ of his trip, to the Provincial Museum at Regina, Mr. Buchanan returned to his home in Scotland, enlisted in the Legion of Frontiersmen (25th Royal Fusiliers) as a private, was sent to East Africa, and served throughout that campaign, rising to the rank of captain, and received the Military Cross, and on being invalided home requested me to prepare a list of the birds collected in 1914. I had already examined the birds in the Museum at Regina in 1915

¹Annual Report, Geological Survey of Canada VIII (new series) Part D, pp. 5D to 120D, Ottawa, 1896. Ibid., IX, 1896, Part F (1897).

²A Biological Investigation of the Athabasca-Mackenzie Region. North American Fauna No. 27. Bureau of Biological Survey, Washington, 1908.

³Report of the Chief Game Guardian, 1914, pp. 33-34, 37-39, Regina, 1915

and I am indebted to Mr. H. H. Mitchell, of the Provincial Museum, Regina, for the loan of any that were needed for comparison. The data on the birds themselves is exceedingly full, and Capt. Buchanan has furnished me with a list of the specimens together with notes on the colors of the soft parts, food, etc., from this I have quoted when necessary, but except in three instances have not used the sight records, which will be given fully in a forthcoming book by Capt. Buchanan.

Colymbus holboelli, Holboell's Grebe.

Set of five eggs taken on Churchill river, June 6; bird seen at close range.

Gavia immer, Loon, Great Northern Diver.

An adult taken on Reindeer lake, July 8.

Larus brachyrhynchus, Short-billed Gull.

An adult female taken on Reindeer lake, July 9; one more seen on same date; this is very far east for this gull. "Iris, clear blackish-grey; edge of eyelid surrounding eye, deep orange chrome; corners of mouth, pure orange chrome; feet, pale whitish-yellow." Dr. Oberholser regards this gull as a subspecies of *Larus canus*.⁴

Larus delawarensis, Ring-billed Gull.

A male taken on Ile-à-la-Crosse lake, May 23; adult except for the black primaries and terminal black band of the tail, probably a non-breeding bird. "Bill, medium dark greenish-yellow, with strong black ring around bill a short distance from tip; eyelids, and corners of mouth, deep orange-chrome; feet, pale greenish-yellow." Seventeen others seen with this bird.

Larus philadelphia, Bonaparte's Gull.

Four specimens, one adult male (thought by the collector to be a non-breeding bird), taken on the Cochrane river, July 20. "Iris dark; bill black; legs and feet, orange-chrome." One adult female, taken on Cochrane river, July 25, "Iris dark; eye-ring, dark crimson; bill, black; corners of mouth, reddish-flesh color; legs whitish orange-chrome; feet, more rich chrome." Two juvenile birds taken on Lake Du Brochet, Cochrane river, August 1, one of these, a female, is marked "Iris, dark; bill, medium dull blackish-grey; both mandibles dark from nostril out; legs, feet, and webs, whitish skin color with pale brown joints." This species is believed to breed in trees, and it is unfortunate in view of the young birds taken, that the nesting site was not found.

Xema sabini, Sabine's Gull.

Three seen and a pair of adults taken on Sandy lake, Churchill river, June 9; the female is marked "Iris, black; pure red eye-ring; bill, black to one-eighth beyond nostril, remainder of tip medium dull lemon yellow; feet, black."

Sterna hirundo, Common Tern.

A juvenile female with primaries not fully grown, taken on Cochrane river, August 14. Seen in company with parents and another young bird.

Mergus americanus, Merganser.

A male in very worn immature plumage, taken on the Churchill river, June 1. "Iris, dark; bill, medium deep crimson, crown of upper mandible, black; feet, bright orange-chrome."

Mergus serrator, Red-breasted Merganser.

An adult female taken on Lake Ile-à-la-Crosse, May 23. "Iris, clear deep umber brown; bill, all red except along crown of upper mandible which is dark horn-brown; legs and feet, rich reddish orange-chrome."

A downy young female, length 14.75 in., taken on the Cochrane river, August 15. "Iris, pale clear brownish sage-green; bill, blackish-brown over crown of upper mandible for entire length, except tip, sides of upper mandible and entire lower mandible pale dull buffish yellow; legs and feet, dull brownish-grey; webs, dull umber-brown. Bird in company with mother and about a dozen young."

Set of twelve eggs taken on rocky island in Reindeer lake, July 12. "Nest, found on ground concealed beneath ledge of rock; eggs almost hard on rock and rim of nest composed of small leaves and twigs profusely mixed with blackish-grey down." *Nettion carolinense*, Green-winged Teal.

A pair taken on the Beaver river, May 18.

Oidemia perspicillata, Surf Scoter.

Three specimens, one adult male, taken at Lake Ile-à-la-Crosse, May 31; two adult females taken on the Reindeer river, June 30. "Flock of about twelve scoters together, all in pairs."

Phalaropus fulicarius, Red Phalarope.

A male taken on Sandy Fly lake, Churchill river, June 11.

Steganopus tricolor, Wilson's Phalarope.

Two specimens, an adult female taken on Crooked lake, May 13. "Bird alone, resting as if tired out, perhaps migrating." The other an adult male taken on the Beaver river, May 19. "Male and female together on floating weeds, on edge of small lake off Beaver river; birds in company with pair of Dowitchers and Lesser Yellow-legs."

Gallinago delicata, Wilson's Snipe.

Nest taken near Lake Ile-à-la-Crosse, May 31. "Four eggs, slightly incubated, nest of damp grasses on ground among low snow-berry bushes. Flushed bird off nest three or four times to-day and yesterday."

Macrorhamphus griseus griseus, Dowitcher.

Five specimens, a pair taken on Crooked lake, May 13, have been compared with a series of this form and of *M. g. scalopaceus*. Another pair

⁴Auk, XXXVI, 1919, pp. 83-84.

taken on the Beaver river, May 19, and a male on Lake Ile-à-la-Crosse, May 23.

Pisobia fuscicollis, White-rumped Sandpiper.

A female taken on Sandy lake, Churchill river, June 10, and a male taken on Sand Fly lake, Churchill river, June 11.

Pisobia bairdi, Baird's Sandpiper.

Four specimens, a female taken near Fort Du Brochet, Reindeer lake, July 17; and a male and two females taken on the Cochrane river, July 23.

Pisobia minutilla, Least Sandpiper.

Four specimens, a female, Reindeer lake, July 13. "Bird alone breeding on island, apparently had nest." A female taken July 29, and a pair taken on the Cochrane river, July 30.

Pelidna alpina sakhalina, Red-backed Sandpiper.

A female, Churchill river, June 8. "Shot on small stony island, in company with seven Semipalmated Sandpipers."

Ereunetes pusillus, Semipalmated Sandpiper.

Two pairs taken on the Churchill river, June 2, from a flock.

Calidris leucophaca, Sanderling.

Three specimens taken from a flock of four, Cochrane river, July 21; "probably non-breeding birds."

Helodromus solitarius solitarius, Solitary Sandpiper.

"A female with large egg in oviduct;" Beaver river, May 18.

Actitis macularia, Spotted Sandpiper.

Two adults, a male, Crooked river, May 15, and a female, Lake Ile-à-la-Crosse, May 23. Two sets of four eggs each, taken on the Churchill river, June 10 and 13, also a downy young taken on the Cochrane river, July 29.

Charadrius dominicus dominicus, American Golden Plover.

An adult female taken when in company with Kildeer Plover, on the Churchill river, June 2. "Eye, bill, and feet black."

Oxyechus vociferus, Kildeer.

Seen in company with the Golden Plover, but no specimens taken.

Aegialitis semipalmata, Semipalmated Plover.

Four specimens, a male, Lake Ile-à-la-Crosse, May 23; a pair, Cochrane river, July 23, and a female taken July 29, also on the Cochrane river.

Arenaria interpres morinella, Ruddy Turnstone.

Four specimens, a female found alone on Lake Ile-à-la-Crosse, on May 22; a male also found alone on the same lake on the 23rd; and two females taken from large flock on June 9, on the Churchill river.

Canachites canadensis canadensis, Hudsonian Spruce Partridge.

Eight specimens, six adults and two downy young.

A pair with nest and eggs taken at Lake Ile-à-la-Crosse, May 25; male not preserved. "Eggs, six in number, fresh; nest on ground close in at foot of alder bush; site, dry open poplar knoll, surrounded by dense spruce and tamarack swamp; nest of dry leaves, same as carpet of surrounding ground, a few feathers lining nest." A male, same locality, May 29. A female in moult, and a downy young, Reindeer lake, July 10, the female has pin feathers on the sides of the head, and new tail feathers are appearing. A downy young, Cochrane river, July 20, was with other young and female parent when taken. A male taken August 3, a female, August 4, and a male, August 7, all adults, Lake Du Brochet. The young could fly, though the first was only five inches in length.

Lagopus lagopus lagopus, Willow Ptarmigan.

One specimen, Fort Du Brochet, Reindeer lake, November 4. "Same day first Barren Land Caribou of the season were shot."

Accipiter velox, Sharp-shinned Hawk.

An adult male, Otter lake, Churchill river, June 20.

Astur atricapillus atricapillus, American Goshawk.

A female, and set of three eggs, Beaver river, May 16.

Buteo platypterus, Broad-winged Hawk.

Three specimens, a melanotic male, Crooked river, May 14, is chocolate brown except for the tail bars, which are normal; a male taken in same locality on the 15th, and a female taken on Beaver river, May 16.

Haliaeetus leucocephalus alascanus, Northern Bald Eagle.

An adult male, taken on the Churchill river, June 12; three downy young taken on Reindeer lake, two on the 7th and one on the 10th of July. These latter are marked, "Iris, dark umber brown; bill, dark horn color; cere, slightly more light brown, corner of mouth, pale whitish-yellow; legs and feet, whitish-yellow."

Falco columbarius columbarius, Pigeon Hawk.

Seven specimens, an adult female (two other birds seen), Reindeer lake, July 13; a female in company with four or five almost fully fledged young, three of which were taken, Lake Du Brochet, August 3; the young have wings and tail not fully grown and traces of down on the head; the old bird is in very worn plumage with one fresh blue tail feather, but showing no other signs of the blue plumage. Two fully fledged young birds (two others seen), Lake Du Brochet, August 7.

Pandion haliaëtus carolinensis, American Osprey.

Three specimens, a female, Crooked lake, May 13; a male, taken with nest, Lake Ile-à-la-Crosse, May 25. "Nest containing single egg on very top

of broken-off dead jack pine; nest mainly built of twigs, inside thickly lined with damp mud, grass and moss; fish scales on edge of nest; the male bird was bringing both talons full of damp moss to nest when shot." A female taken with nest and two eggs, Churchill river, June 6.

Surnia ulula caparoch, American Hawk Owl.

A male taken on Lake Du Brochet, August 1.

Picoides arcticus, Arctic Three-toed Woodpecker.

An adult male, Cochrane river, July 13; yellow crest, much worn, exposing the white bases of the feathers.

Picoides americanus fasciatus, Alaskan Three-toed Woodpecker.

An adult female, Fort Du Brochet, October 22.

Sphyrapicus varius varius, Yellow-bellied Sapsucker.

Two males, Big river, May 7 and 11.

Colaptes auratus borealis, Boreal Flicker.

One female, Cochrane river, July 21; the male seen. There is another adult female in the United States National Museum taken at Lake Du Brochet, September 26, 1890. This form is included in the range of *luteus* in the A.O.U. Check List.

Sayornis phoebe, Phoebe.

A male, Reindeer river, June 30.

Nuttallornis borealis, Olive-sided Flycatcher.

Two males, Lake Ile-à-la-Crosse, May 27 and 28.

Empidonax traillii alnorum, Alder Flycatcher.

Three specimens, a male, Churchill river, June 6; two from the Cochrane river, July 27 and 28, the latter a female. All taken in willows at edge of marsh.

Empidonax minimus, Least Flycatcher.

A female, Lake Ile-à-la-Crosse, May 29, and a male, Reindeer river, June 28.

Perisoreus canadensis canadensis, Canada Jay.

One immature bird, Reindeer lake, July 11, is somewhat difficult to place; it compares well with one of about the same age from 40 miles southwest of Calgary, Alberta, August 4, 1895; and is not so dark above as a younger bird from near Latchford, Ontario, June 10, 1906. Preble refers to a breeding bird from Pelican Narrows, Churchill river, in the United States National Museum,⁵ and in fact Reindeer lake is well within the known range of *canadensis*.

Corvus corax principalis, Northern Raven.

Five specimens; three from Churchill river; a young bird taken from the nest, June 2; an adult female, June 18, and a young bird fledged and in company with parent and two other young; two adult males taken December 15, one on Lake Du Brochet, the other on Reindeer lake.

Corvus brachyrhynchos subsp? American Crow.

An immature female taken on the Reindeer river, June 29; this bird compares well with a breeding female from Craven, Saskatchewan, much better than it does with Ontario birds, and may better be placed with the Western Crow, *C. b. hesperis*, but owing to lack of material of comparable age I hesitate to do so.

Euphagus carolinus, Rusty Blackbird.

Three specimens from Lake Du Brochet, August 7, an adult male, "Iris, clear yellowish-white," an immature (female?) "Iris, medium clear umber brown;" and an immature male, "Iris, pale sage green."

Carpodacus purpureus purpureus, Purple Finch.

Two adult males, Big river, May 9; a female seen with these.

Acanthis linaria linaria, Redpoll.

Three specimens, an adult male with rosy breast, Cochrane river, July 21, "Bird in company with one young; bill, dark brownish." Two males, an adult and young, Lake Du Brochet, August 10; "bill, flat black" in the young.

Plectrophenax nivalis nivalis, Snow Bunting.

One specimen, Reindeer lake, October 23. "Large flocks of these birds for the past fortnight."

Passerculus sandwichensis subsp? Savannah Sparrow.

Three specimens, one from Lake Ile-à-la-Crosse, May 27; an adult male from Fort Du Brochet, July 17; and a juvenile female, Cochrane river, July 28. These are very dark birds, much more so than *alaudinus* should be, and very different from the light race that breeds in southern Saskatchewan which is, no doubt, *nevadensis*.

Passerberbulus lecontei, Leconte's Sparrow.

Two specimens, one of a pair, Churchill river, June 2; a male, Haultaine river, June 6. "Birds breeding here."

Zonotrichia querula, Harris's Sparrow.

Seven specimens, an adult female, and a juvenile male, Cochrane river, July 26; an adult male, Cochrane river, July 30. "Male and female with fledged young." A female and young bird, Cochrane river, July 31; a female, Cochrane river, August 3. "Bird in company with others, probably her fully fledged young." An adult female, Lake Du Brochet, August 6. Adult's "bill, dull senna brown," juvenile's, "bill blackish-brown, yellow along edges of mandibles and at corners of mouth." So little is known of the early plumages of this sparrow that a description of the young of July 31, may not be out of place: length 3.75 in., pileum with feathers brownish-black, indistinctly edged with grayish-buff, producing a dark crown with a few grayish-buff spots; throat and chin grayish-buff, throat with a

⁵North American Fauna No. 27, 1908, p. 402.

few blackish-brown spots; chest brownish-buff streaked with brownish-black; flanks buff with brown streaks, rest of under parts buffy-white; above brown streaked with black, upper tail coverts brownish-buff tail darker than in adult; wing coverts tipped with buff.

Zonotrichia leucophrys gambelii, Gambel's Sparrow.

Three specimens, an adult male and a juvenile male, Reindeer lake, July 16; and a young male, Cochrane river, July 26.

Spizella monticola monticola, Tree Sparrow.

A male, Reindeer lake, July 11. "Two pairs breeding on an island, first seen on trip." A female, Fort Du Brochet, July 17. "Bird had young almost fully fledged."

Spizella passerina passerina, Chipping Sparrow.

A male, Lake Ile-à-la-Crosse, May 27.

Melospiza melodia melodia, Song Sparrow.

A pair, Reindeer river, June 28.

Melospiza lincolni lincolni, Lincoln's Sparrow.

A male, Reindeer river, June 29.

Melospiza georgiana, Swamp Sparrow.

A male, Churchill river, June 6. "Small colony of these birds breeding at this place."

Passerella iliaca iliaca, Fox Sparrow.

Four specimens, all males, one Reindeer lake, July 11; three, Cochrane river, July 18 and 24, and August 3. The July 24 bird was carrying food to fledged young.

Petrochelidon lunifrons lunifrons, Cliff Swallow.

Two females, Churchill river, June 9; a pair, Cochrane river, August 6, fully fledged young in company with these last.

Iridoprocne bicolor, Tree Swallow.

Two specimens, a female, Crooked river, May 15; a young male, Lake Du Brochet, August 6. Two sets of eggs taken on the Churchill river, June 11; nests in old woodpecker holes in dead poplars.

Riparia riparia, Bank Swallow.

A male, Sandy lake, Churchill river, June 9.

Bombicilla garrula, Bohemian Waxwing.

Two specimens from Cochrane river, a juvenile male taken July 28. "Iris, dark, not reddish-brown, like adult." An adult female, July 30.

Bombicilla cedrorum, Cedar Waxwing.

A male, Key lake, June 25.

Lanius borealis, Northern Shrike.

A male, Cochrane river, October 19.

Vireosylva olivacea, Red-eyed Vireo.

A male, Dead lake, Churchill river, June 17.

Lanivireo solitarius solitarius, Blue-headed Vireo.

A male, Lake Ile-à-la-Crosse, May 28.

Mniotilta varia, Black and White Warbler.

A male, Beaver river, May 17.

Vermivora peregrina, Tennessee Warbler.

Three males, two from Lake Ile-à-la-Crosse, May 27, and June 2, one from Dead lake, Churchill river, June 17.

Dendroica aestiva aestiva, Yellow Warbler.

Two males, one Lake Ile-à-la-Crosse, May 27, the other Reindeer lake, July 4; this latter is only a little more worn than the May bird.

Dendroica coronata, Myrtle Warbler.

Three specimens, two adult males, from Big river, May 7 and 8; a juvenile, Cochrane river, July 27. Hoover's Warbler, *D. c. hooveri* has recently been revived by Dr. Oberholser and the range of this western race of the Myrtle Warbler is given as reaching east to central Mackenzie, but the adult taken May 8, which I have been able to compare with a series of both the supposed races; is nearer to *coronata*.

Dendroica striata, Black-poll Warbler.

A male, Beaver river, May 18.

Dendroica palmarum palmarum, Palm Warbler.

A male, Beaver river, May 18.

Seiurus noveboracensis noveboracensis, Water-Thrush.

Three specimens, a female, Beaver river, May 20; a male, Knee lake, Churchill river, June 6; and a female, Reindeer river, June 28. These are close to Grinnell's Water-Thrush, *S. n. notabilis*, in color.

Wilsonia pusilla pusilla, Wilson's Warbler.

A male, Lake Ile-à-la-Crosse, May 26.

Sitta canadensis, Red-breasted Nuthatch.

A male, Lake Ile-à-la-Crosse, May 25.

Penthestes hudsonicus hudsonicus, Hudsonian Chickadee.

Three specimens, a pair taken at Big river, May 8; and a young bird, Cochrane river, July 24. This last is interesting though full-grown (length 5 in.), the pileum instead of being soft grayish-brown is blackish-brown, forming a distinct cap, while the hind neck and back are brownish-gray.

Regulus calendula calendula, Ruby-crowned Kinglet.

Three specimens, a male, Lake Ile-à-la-Crosse, May 28; a female taken with nest containing young, Churchill river, July 3; and a male taken, Reindeer lake, July 9. The nest taken July 3 is described as follows: "Nest in young spruce tree about ten feet high, nest against limb and about eight feet up. Nest contained seven young, about fourteen days old."

Hylocichla aliciae aliciae, Gray-cheeked Thrush.

Two males, Big river, May 11; Churchill river, June 18. This latter is in very worn plumage. "Bird in company with mate."

Hylocichla ustulata swainsoni, Olive-backed Thrush.

Two males, Ile-à-la-Crosse, May 25; and Black Bear island, Churchill river, June 14.

Hylocichla guttata pallasi, Hermit Thrush.

A male, Beaver river, May 18.

RANDOM BOTANICAL NOTES.

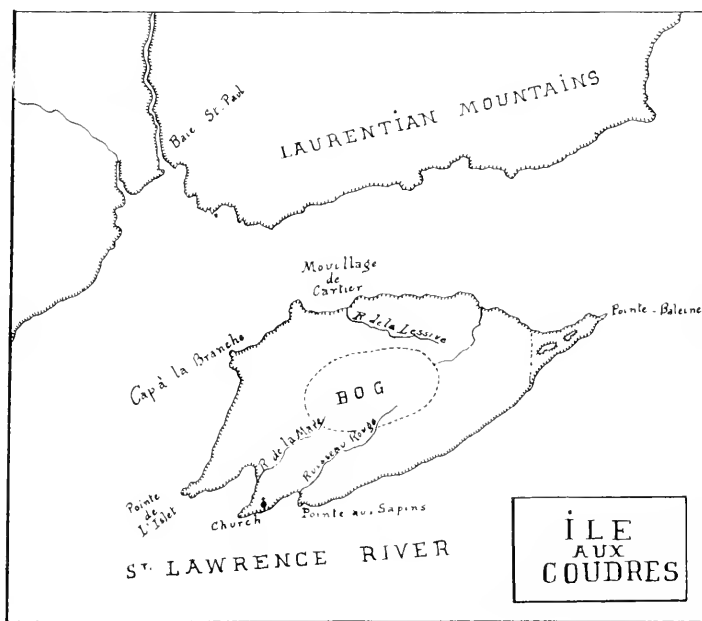
III. ISLE-AUX-COUDRES, QUE.

BY BRO. M. VICTORIN, LONGUEUIL COLLEGE, QUE.

For the purpose of furthering phytogeographical researches bearing upon the semi-halophytic section of the St. Lawrence river, and with the special aim of collecting specimens of *Carex* for monographical work, we alighted by noontide on June 22, 1917, on the Baie St. Paul wharf; our plant-press and other botanical outfit, though not imposing too much on the sturdy shoulders of the natives, nevertheless excited their curiosity to the utmost.

ically and botanically. We have given elsewhere¹ the impressions gathered from that quaint romantic spot which has preserved to an almost incredible degree, the language, customs and traditions of the 17th century and which, moreover, retains the most remarkable originality of not being spoiled by tourists. The following lines intend only to record briefly the botanical data collected.

Isle-aux-Coudres is of about fifteen miles' cir-



Like most of the members of the botanical fraternity, we have never succeeded in making clear to the average guide, driver or paddler, the point of view of the botanist. Notwithstanding this failure and through the good offices of François Bouchard, we crossed the channel and landed on Isle-aux-Coudres towards four o'clock. At the west end of the island, there is no other sort of wharf than François Bouchard's back, but this is as sure as a cantilever bridge. One who takes a strong hold about the fellow's neck crosses the wide expanse of mud and *Fucus* stretching at low tide between the water and the shore proper without injury to his boots.

A full week was spent visiting the island histor-

cumference and lies in the course of the St. Lawrence river about fifty miles below Quebec city. Though the inspection of a map would make one think that it belongs to the north shore, from which it is separated only by a relatively narrow channel, yet, like most—probably all—of the St. Lawrence islands it is on the southeastern side of Logan's fault, and is really a detached part of the south shore, showing the same inclined strata of shale and limestone as the near-by Cambrian Sillery of L'Islet. The whole island is an upland of from 50 to 100 feet elevation surrounded by a narrow alluvial

¹Fr. Marie-Victorin, *Croquis laurentiens: Isle-aux-Coudres*, *Le Parler Français*, Vol. XVI, No. 1, pp. 164-171. 1917.

prairie. The centre is slightly depressed and occupied by an extensive bog which suggests that the place was, in geologically recent times, somewhat atoll-shaped. The river waters are decidedly fresh, less so at the lower end. The wave action—very powerful, save on the northern side sheltered by the high Laurentian cliffs of the mainland—has produced a noticeable bar of sand and gravel behind which has developed a continuous lagoon generally transformed into a marsh by the invasion of halophytes.

The leading plant in this particular habitat is the polymorphic *Carex acuta* L. (= *C. goodenoughii* J. Gay); the abundant rhizomes form a felted entanglement about as troublesome to farmers as the familiar couch grass. It is locally called "teigne," a very expressive word with the French Canadians, indicating something not easy to get rid of. Various sedges and flowering plants help *C. acuta* in filling the lagoons: *Carex recta* Boott, *Carex canescens* L., var. *disjuncta* Fernald, *C. Tuckermanni* Dewey, *C. crinita* Lam., *C. maritima* Müell., *Caltha palustris* L., *Spathyema foetida* (L.), Raf., which occurs also in dry ground, *Menyanthes trifoliata* L., *Taraxacum officinale* Weber, var. *palustre* (Sm.) Blytt., *Cardamine pennsylvanica* Muhl., *Pedicularis palustris* L., *Sisyrinchium angustifolium* Mill., *Galium palustre* L., *Triglochin maritima* L. *Myosotis laxa* Lehm., and true *Viola cucullata* Ait., a name regarding which there has been some confusion in recent years.

No botanist would neglect a favorable opportunity to visit a northern bog. So, we started one fine morning with a party of barefooted youngsters roused to a high pitch of enthusiasm by trout prospects in the "Rouisseau Rouge." "Rouisseau Rouge," which derives its name from the dark color of the acid waters, is a brook discharging the bog waters into the St. Lawrence.

The Isle-aux-Coudres bog does not seem to differ materially from those of Rimouski and Temiscouata. As far as we have been able to see there is no free water in it. At this early season the water table was so high that we were able to inspect only the outer zone. With the usual *Kalmia angustifolia* L. *Kalmia polifolia* L. and *Ledum groenlandicum* Oeder, we were glad to see for the first time the fine flowers of *Rubus Chamaemorus* L. The amber-colored fruits are known everywhere in this district as "blackbières" an obvious corruption of the English word "blackberry." All those who have seen the ripe fruit of this plant will, no doubt, wonder at such a linguistic feat.

The genus *Carex* is always worthy of investigation in northern bogs. Here were found *C. trisperma* Dewey, a small form of *C. pauciflora* Lightf., and a new variety of *C. paupercula* Michx., which

Mr. M. L. Fernald of the Gray Herbarium has recently described² as follows:

"*Carex paupercula* Michx., var. *brevisquama* n. var., squamis 3-4 mm. longis perigynium subaequantibus. Scales 3-4 mm. long, about equalling the perigynium. Quebec: Isle-aux-Coudres, Charlevoix Co., June, 1917, Bro. M. Victorin, No. 4021 (type in Gray Herbarium).

Remarkable for its very short scales which give the plants a distinctive aspect, the long-acuminate scales of typical *C. paupercula* being 5-8 mm., in length and much exceeding the perigynium. M. L. Fernald, Gray Herbarium."

The departure from the typical form is indeed striking and in the light of more abundant material might prove specific. The plant grew in a dense mass forming a small tussock.

Mr. M. L. Fernald had already made a detailed study of *C. paupercula* and its allies,³ indicating clearly that the plant described by Michaux⁴ is in reality a northern extreme of the *C. irrigua* of J. E. Smith.⁵ Consequently, Michaux's name has priority. Furthermore, Michaux's plant, collected at Lake Mistassini has been shown to be of restricted boreal distribution, the species being represented southward by three distinct variations which may be summarized as follows:

CAREX PAUPERCULA AND ALLIES.

Pistillate spikes short-oblong, 4-10 mm. in length.

Pistillate scales 2-3 times as long as the perigynium.

1. *C. paupercula*.

Pistillate scales about equalling the perigynium.

2. *C. paupercula* var. *brevisquama*.

Pistillate spikes cylindric, 10-18 mm. in length.

Pistillate scales dark, castaneous; culms glabrous.

3. *C. paupercula* var. *irrigua*.

Pistillate scales green with brown border; culms scabrous.

4. *C. paupercula* var. *pallens*.

Carex paupercula Michx.—Northern Quebec; Lake Mistassini and the Shikshocks Mountains of Gaspé.

Carex paupercula Michx., var. *brevisquama* Fernald—Quebec; known only from the type locality, Isle-aux-Coudres.

Carex paupercula Michx., var. *irrigua* (Wahlemb.) Fernald—Boreal and alpine Europe, subarctic regions and cold bogs of America: Quebec, Ontario, Nova Scotia, Massachusetts, Pennsylvania, Utah.

Carex paupercula Michx., var. *pallens* Fernald—Nova Scotia, Maine, New Hampshire, Massachu-

²Rhodora XX: 152, 1918.

³Rhodora VIII: 73, 1906.

⁴Flora Boreali-Americana II: 172, 1803.

⁵Hoppe, Caric. Germ.: 72, 1826.

setts, Connecticut, New York, Michigan, Vermont, Minnesota, British Columbia, Ontario.

To finish with the sedges, we will mention *C. stipata* Muhl., *C. brunescens* (Pers.) Poir., and *Carex angustior* Mackenzie found here and there on the island, giving a total of thirteen species met with—a rather small number.

In June very few grasses are suitable for collecting and only *Poa pratensis* L. and *Poa alsodes* Gray were gathered.

Among early-flowering genera, the often associated *Viola* and *Antennaria* hold an important place. The collection of true *Viola cucullata* Ait. in damp ground has already been mentioned. In the woods outside the bog zone, *Viola renifolia* Gray, var. *Brainerdii* (Greene) Fernald, is abundant. On shaded ledges near the water, *Viola septentrionalis* Greene was growing profusely with the snow-white *Antennaria canadensis* Greene. No other *Antennaria*—not even the ubiquitous *A. neodioica*—was detected on the island.

Nobody who has read the history of this country can leave Isle-au-Coudres without paying a visit to Cap à La Branche where in the times of Wolfe, Nicette Dufour and François Savard captured the grandson of Admiral Durrell. Cap à La Branche is naturally but a low cliff covered with bushes and with a few white cedars which are supposed to have been Dufour and Savard's hiding-place—a snug one indeed. A brooklet runs down and supplies sufficient moisture to induce a gorgeous growth of *Saxifraga virginensis* Michx. and *Draba arabisans* Michx.

At the Pointe-de-L'Islet, on exposed ledges facing the sea, the short grass was strewn with the innumerable white flowers of *Cerastium arvense* L., and the strict rose-tinted inflorescences of *Arabis brachycarpa* (T. and G.) Britton.

Close observers have already remarked that the older settlements in Quebec exhibit unusual floristic features which should be attributed to historical factors. The first settlers, the missionaries, the "Médecins du Roi," the nuns, were far from being *minus habens* and the gardens inside the palisade usually contained the best drug plants in favor at the time. When cultivation happened to cease on that particular spot, the plants had very often gained a strong foothold and were able to persist for centuries. A striking example of this is the abundance and persistence to date of *Serapias helleborine* L., on Mount Royal, Montreal Island, the only instance of an introduced orchidaceous plant that I know of.

On Isle-aux-Coudres we have observed an extraordinary abundance of Boraginaceae: *Echium vulgare* L., *Cynoglossum officinale* L., *Echinosper-*

mum Lappula Lehm., *Myosotis laxa* Lehm., *Lithospermum arvense* L. and others. The peculiarity can be noted about Quebec city and Mr. M. L. Fernald finds the same to be true of the old Gaspé settlements.

Hyoscyamus niger L. which we found rooted in the beach gravels on the southern side is evidently another introduction traceable to the drug-garden of early days. Singularly enough our field experience with this plant in Quebec has shown it to occur mainly on island beaches of historical fame: Il^{es} des Soeurs (Chateauguay), Ile Sainte-Hélène (Montreal), Isle-aux-Coudres. Moreover, it has been noted that this weed introduced into New England by early settlers and recorded there as far back as 1672, has almost completely disappeared. It is a remarkable fact, adds Mr. M. L. Fernald,⁶ that in Quebec, all along the St. Lawrence river, it is maintaining its own and its weed-character.

Tagopogon pratensis L. is common about buildings at Isle-aux-Coudres. It seems to be an introduction of the same class. The only other locality I know of in Quebec is about the base of Beloeil Mountain where it thrives in the old orchards.

Owing to the lack of sodium chloride in the surrounding waters the halophytes are few. *Fucus vesiculosus* L., however, is very abundant on the slanting rocks of the tidal shores, and is almost wholly relied upon as a fertilizer for potato fields. A scanty colony of *Cañile edentula* (Bigel) Hook., and a few bluish rosettes of *Mertensia maritima* (L.) S. F. Gray, were found among purpose offal at the Pointe-de l'Islet.

We have as yet said nothing of the trees and shrubs; these have intentionally been kept for the end. The first thing a botanist is likely to look for when setting foot on Isle-aux-Coudres is the Hazelnut (*Corylus rostrata* Ait.) from which the place (l'ysle ès Coudres of Cartier) has derived its name. And yet, we have searched in vain for it all around. My friend, Jean-Baptiste Desgagné—a most important man, simultaneously farmer, postmaster, captain and sexton—informs me that he faintly remembers having seen one small bush in his youth . . . but he is not sure! There is some difficulty to reconcile this fact with Jacques Cartier's assertion which runs thus: . . . *et entre autres il y a plusieurs coudres franches fort chargées de noisilles aussi grosses et d'une meilleure saveur que les nôtres, mais un peu plus dures. Et par cela nommames ysle-es-couldres.*⁷

Abbé Casgrain, presumably solely on Cartier's authority reasserts the same: "Comme au temps

⁶Fernald, M. L., Notes from the Phaenogamic Herbarium, I. *Rhodora* XII: 191, 1910.

⁷Cf. Brief récit et succincte narration, etc., of Cartier, 1545. Manuscript in the British Museum.

jadis, cette plage est encore pleine de beaux et grands arbres de plusieurs sortes, et il n'y a qu'à étendre la main pour cueillir sur les coudres franches, les grappes de noisilles."^s

Cartier's landing place, the so-called "Ruisseau à la lessive" is yet in its natural state, and it is very hard to believe that ecological conditions have changed enough in four centuries to expel the hazelnut from the island. Were it not for the express mentioning of the fruits, our opinion would be that Cartier was simply mistaken as to the identity of the shrub, and that his hazelnut was nothing else than the Common Northern Alder [*Alnus incana* (L.) Moench] which is very abundant in the damp places about "Ruisseau à la lessive." The European Hazelnut is taller than ours and in this respect much like our Alder.

The sloping gravels that lead from the tableland to the beach are occupied by an association of trees and shrubs very likely—as hinted above—in their natural state. At the time of our visiting the white corymbs of a thorn (*Crataegus flabellata* (Bosc.) K. Koch.) were to be seen all over together with the ripe catkins of *Salix rostrata* Richardson var. *luxurians* Fernald. Others were *Nemopaathes mucronata* (L.) Trel., *Amelanchier sanguinea* (Pursh) DC., var. *gaspensis* Wiegand, and the northern variety of the Balsam Poplar (*Populus balsamifera* L., var. *Michauxii* Henry). This interesting tree exhibited its peculiar short cordate leaves.

Pointe-à-la-Baleine, the lower end of the island,

^sCasgrain, Abbé R. H., Excursion à l'Île-aux-Coudres.

is occupied by a flat and low gravel barren where only isolated patches of *Juniperus siberica* Burgsd., and stunted white spruce have been able to maintain their own. Not a blade of grass, not a weed, not a dandelion. The dwarfed trees assume the peculiar short conical shape and the densely felted habit observed on Anticosti. Sometimes the lower branches have developed and lie flat on the ground, and in a few instances, the tree, after ending in a point spreads anew giving to the whole the appearance of two superposed trees. This restricted growth and accompanying modifications is no doubt due to the continuous stress of the prevailing wind, the well-known *nord-est* of the lower St. Lawrence region.

One of the most puzzling things we collected during our short stay at Isle-aux-Coudres was a striking seminal variation of the Sugar Maple (*Acer saccharum* L.) It is known as distinct by the natives and Mr. Desgagné calls it "*Erable blanche*." There is a grove of these trees at the Pointe-aux-Sapins, past "Ruisseau Rouge" and not far from the church. While taking a walk over there after supper in search of sunset effects, we noticed the peculiar appearance of the thin leaves, glaucous underneath some of which are perfectly three-lobed, and the remarkable fruit with wings curving inwards. The tree is clearly the var. *glaucum* of Sargent in its essential characteristics. We do not think it is necessary, however, in the absence of material from somewhere else, to impose upon the plant a new name, as it may be but a freak of a teratological instance.

NOTES AND OBSERVATIONS.

BREEDING OF MOURNING DOVE NEAR OTTAWA, ONTARIO.—On the afternoon of July 3, 1919, it was reported to me that a Passenger Pigeon was nesting in the orchard of Mr. R. T. Richardson, of Woodroffe Farm, near Britannia. I went out in the evening and Mr. Richardson showed me the nest, on a horizontal branch of an apple tree, on the northeast side, about six feet from the ground. The bird remained quietly on the nest and allowed us to examine her from all sides, first from a distance with field glasses, and later from a distance of only three or four feet. The bird had the typical light buffy grayish head and neck, with paler throat, and a small dark spot on each side of the head; wings with some dark spots—an undoubted specimen of the common Mourning Dove, *Zenaidura macroura carolinensis* (Linnæus). The lack of slaty blue on head and upper throat and the small size easily proved that the bird was not the Pas-

senger Pigeon. The Mourning Dove is rare this far north in the east, although it ranges well to the northward in the prairie provinces. Mr. Richardson said that the dove had been sitting on eggs for about two weeks, and when she finally fluttered off to the ground and away over the grass, we saw two blackish pin-feathered squabs on the scanty platform of a nest. The Passenger Pigeon is now believed to be extinct, but all of the many supposed occurrences of this species which have been investigated carefully have proved to be Mourning Doves. The two species have a general resemblance to each other, in shape, color, and proportions, and may be confusing when seen alone. The observer who will remember that the Mourning Dove averages only about 12.5 inches in total length while the Passenger Pigeon averages 17.0 inches as well as being fully twice the bulk of the former

species, as well as the distinctive color differences mentioned above, need make no mistake.

Mr. Richardson stated that he had caught as many as eighteen pigeons in a net at one time in the early days near Ottawa, and that the pigeons would soon clean up a field of peas, alighting along the rows and rapidly moving along, making short flights over each others' heads as soon as the spot was cleared of peas.

R. M. ANDERSON.

BACHMAN'S SPARROW AN ADDITION TO THE CANADIAN FAUNA.—One does not often have an opportunity of making an addition to the list of birds found in Canada, but when such an accomplishment is sought, the best place for the focus of effort is Point Pelee, where there is the maximum of chance to get southern stragglers. In the Bird Book, at Camp Coues, the headquarters of ornithological enthusiasm at the Point, there is a list of the species not yet recorded there, but regarded as among the immediate probabilities. In that list along with Pine Grosbeak, Red-bellied Woodpecker, Carolina Chickadee, and others, stood the name of Bachman's Sparrow, but on April 16, 1917, that name was erased. On that day, as the writer in company with Prof. J. W. Crow, was examining a lot of shrubbery at the north end of Mr. Langell's large orchard, our ears were met with a peculiar trilling song divided into two periods, the first at a lower pitch and much more rapidly delivered, than the second. The difference in pitch was one-fifth, and the speed of the first phrase was almost exactly twice that of the second. Neither of us recognized the song, and we were delighted on shooting it to find that we had the first Bachman's Sparrow to be recorded for Canada. The bird was a male and measured as follows: length 154 mm., wing 65, tail 63, tarsus 18. Records for northern Ohio are scanty, but there is a recent one for a locality opposite Point Pelee, recorded, I believe, in the Wilson Bulletin. The specimen is number 4140 in my collection.

W. E. SAUNDERS.

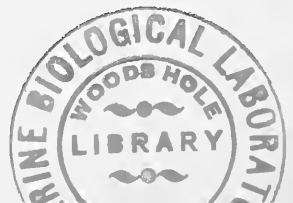
THE STATUS OF BEWICK'S WREN IN ONTARIO. The record of occurrence of this species in Ontario is brief and the number of observers concerned still briefer. It has been regarded as strictly casual, and the following statement of our knowledge of it

is made with the hope of changing the present estimate.

The first specimen was taken by the writer on Dec. 12, 1908, about 25 miles west of London. The day was fairly mild, with a little snow on the ground, and the wren was found in the roots of a fallen tree, busily hunting for food. Recognizing it as an unusually dark wren, it was collected with the hope of gaining some knowledge about the family. When it proved to be a Bewick's a new species for Canada, interest was increased, but further search was unproductive until on April 24, 1909, one was heard singing, and was collected, from a tree immediately beside the "shack" at Point Pelee. The addition of another specimen on the 26th, from a different part of the Point, was the first real hint received that the bird was anything but a casual. Then our knowledge stood still for years. Stories came to our ears of large dark wrens, seen near the edge of the marsh in the winter and there was always the surmise that one of these might be taken, and prove to be a Bewick's, thereby supporting the idea that it was a regular inhabitant of the province. That hope has not been realized, and the identity of those so-called marsh wrens, wintering at the Point, is still a mystery. But on April 1, 1917, another Bewick's Wren was seen and heard to sing within 25 yards of the house. The next day, Sunday, he was still around, and on Monday came the great event in the world of wrens, when we saw and heard no less than five birds, and felt that we would not be too destructive in taking one of them, which we did.

Our experience at the Point is that every so often (a phrase that succinctly expresses the exactness of our knowledge in the matter) there comes a day when some species has its day of migration. We have seen the days of Bluebirds, Blue Jays, male Marsh Hawks, Black Poll Warblers, etc., and, here, at last, seemed to be the day of Bewick's Wren. Five in one day of a species of which all the previous years had disclosed but three, was truly a great number, and tells in terms not to be denied, that Bewick's is a regular resident of Ontario, whose exact domicile in summer is yet to be disclosed. Time alone will tell if this theory is correct, and it may easily prove that the instance is one of varying abundance, so often exhibited in the case of species studied at or near their northern limit.

W. E. SAUNDERS.



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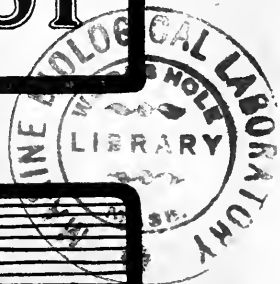
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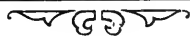
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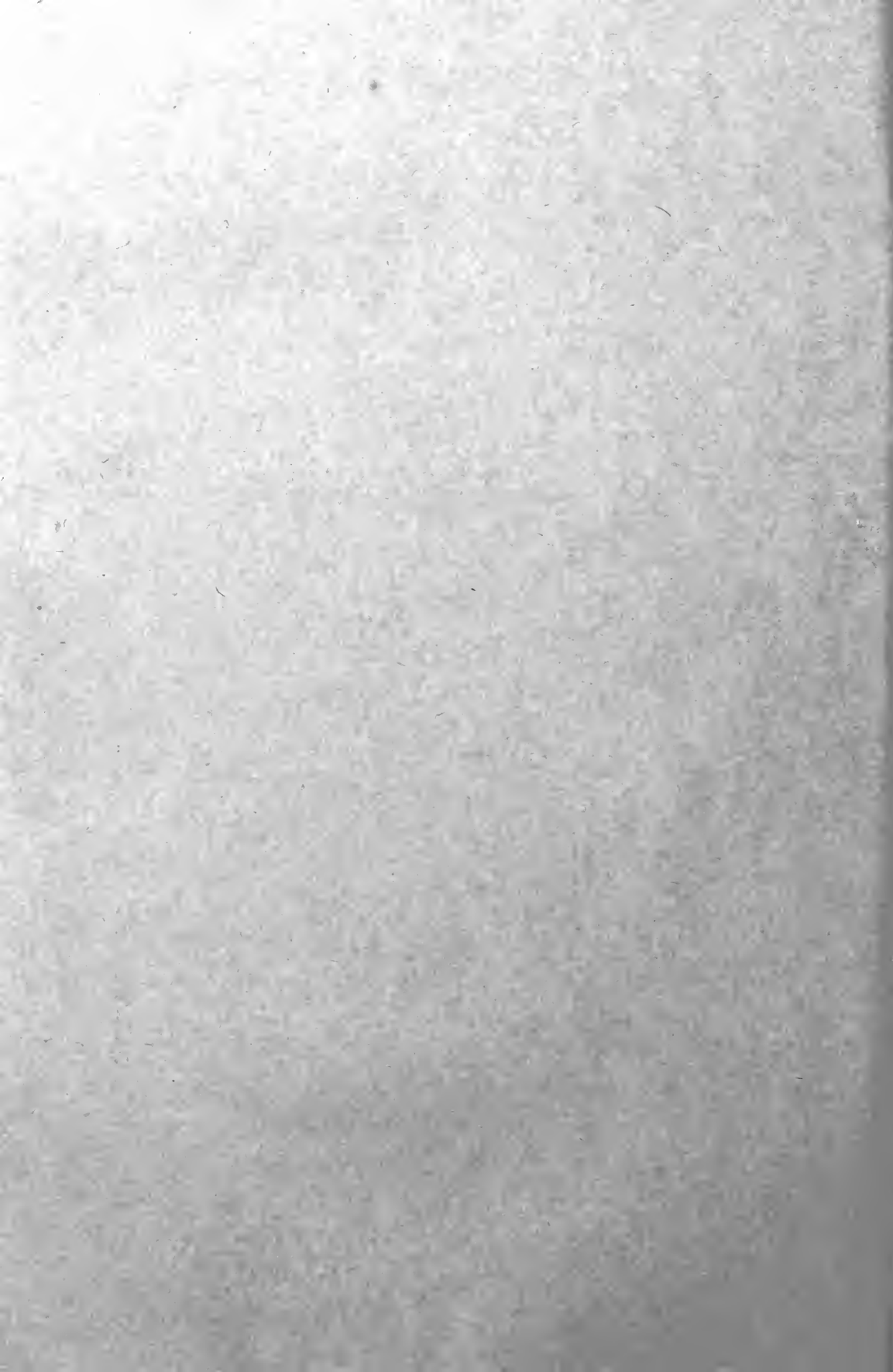
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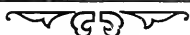
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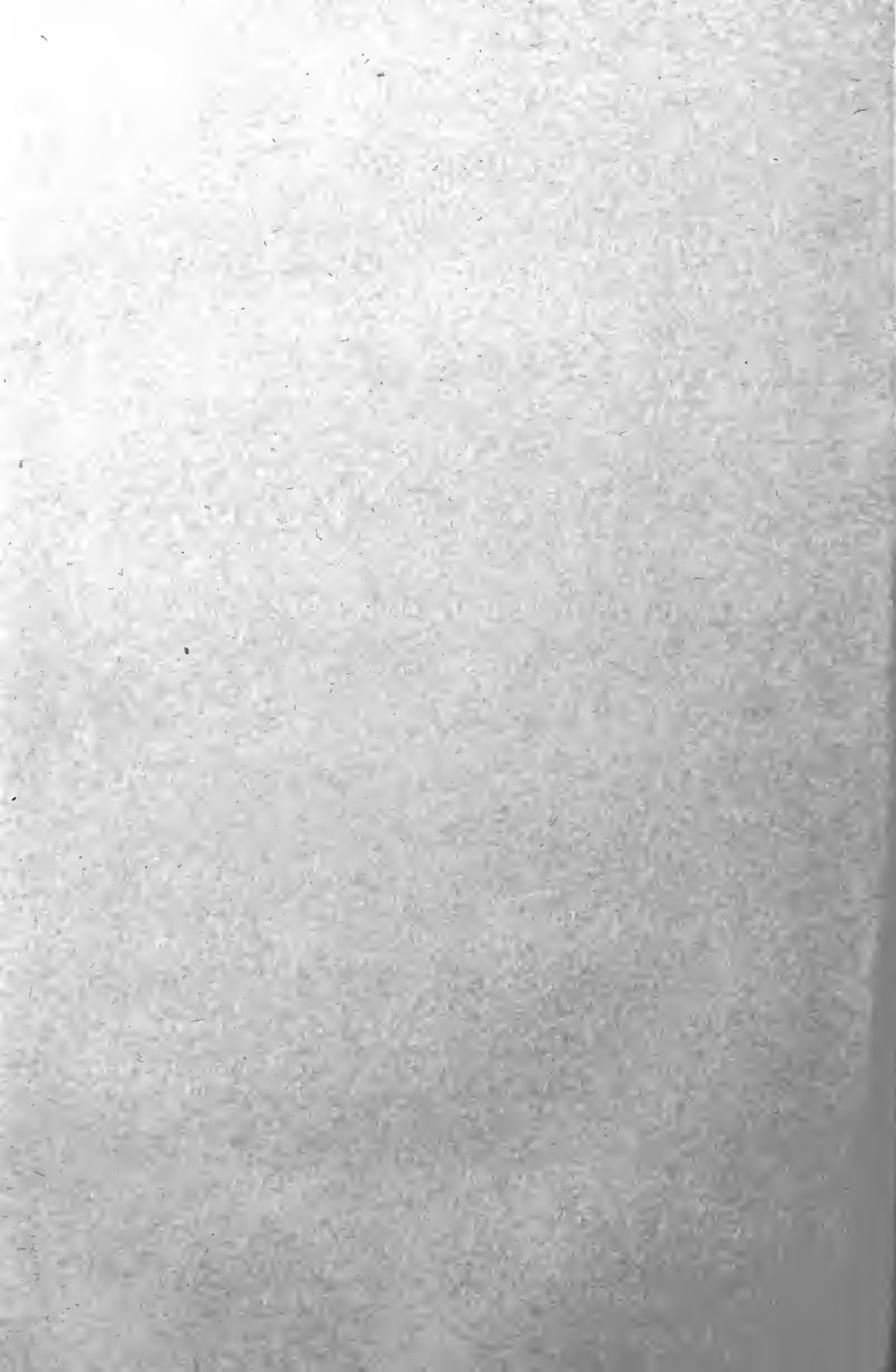
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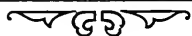
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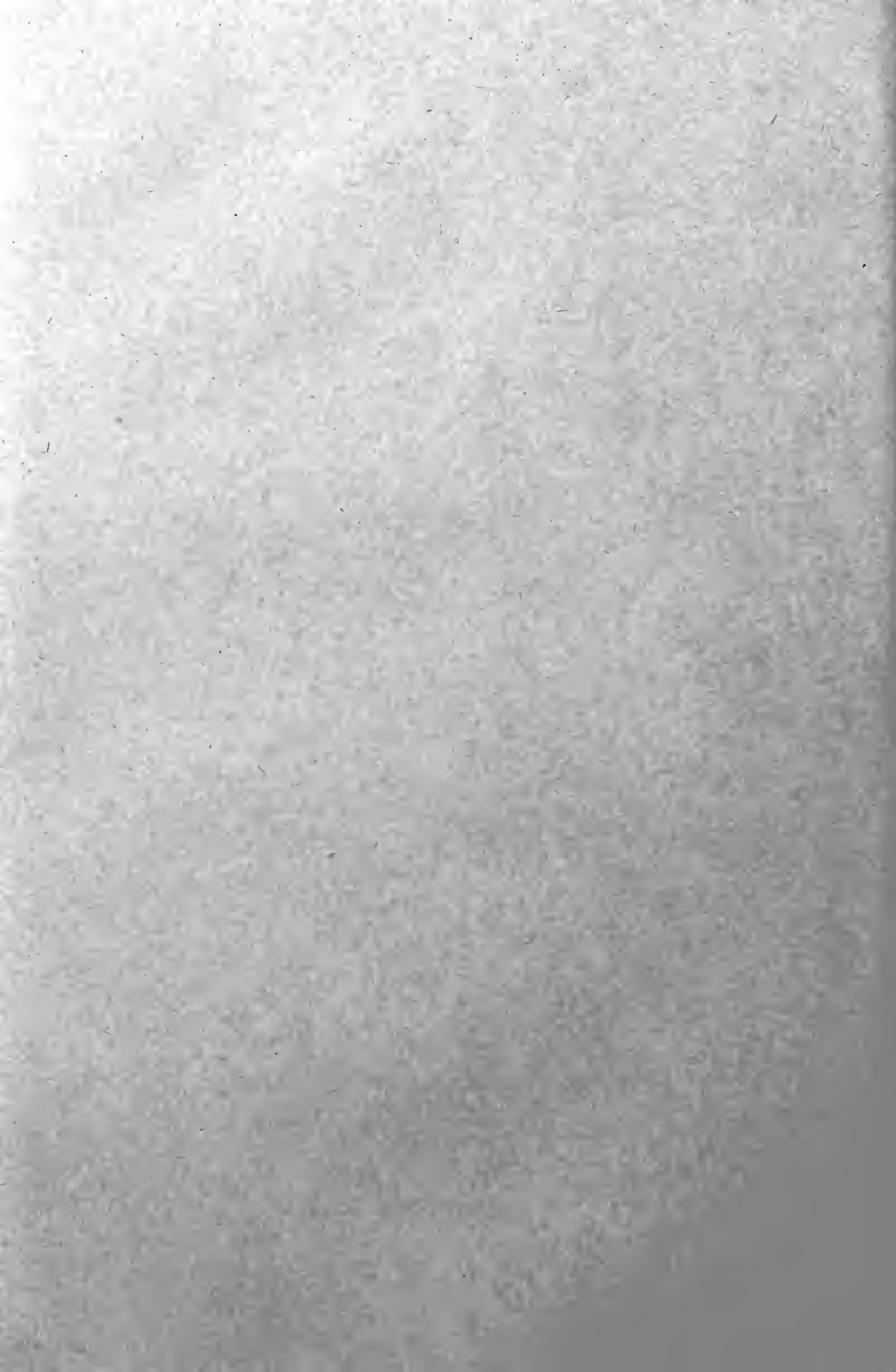
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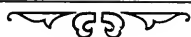
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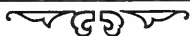
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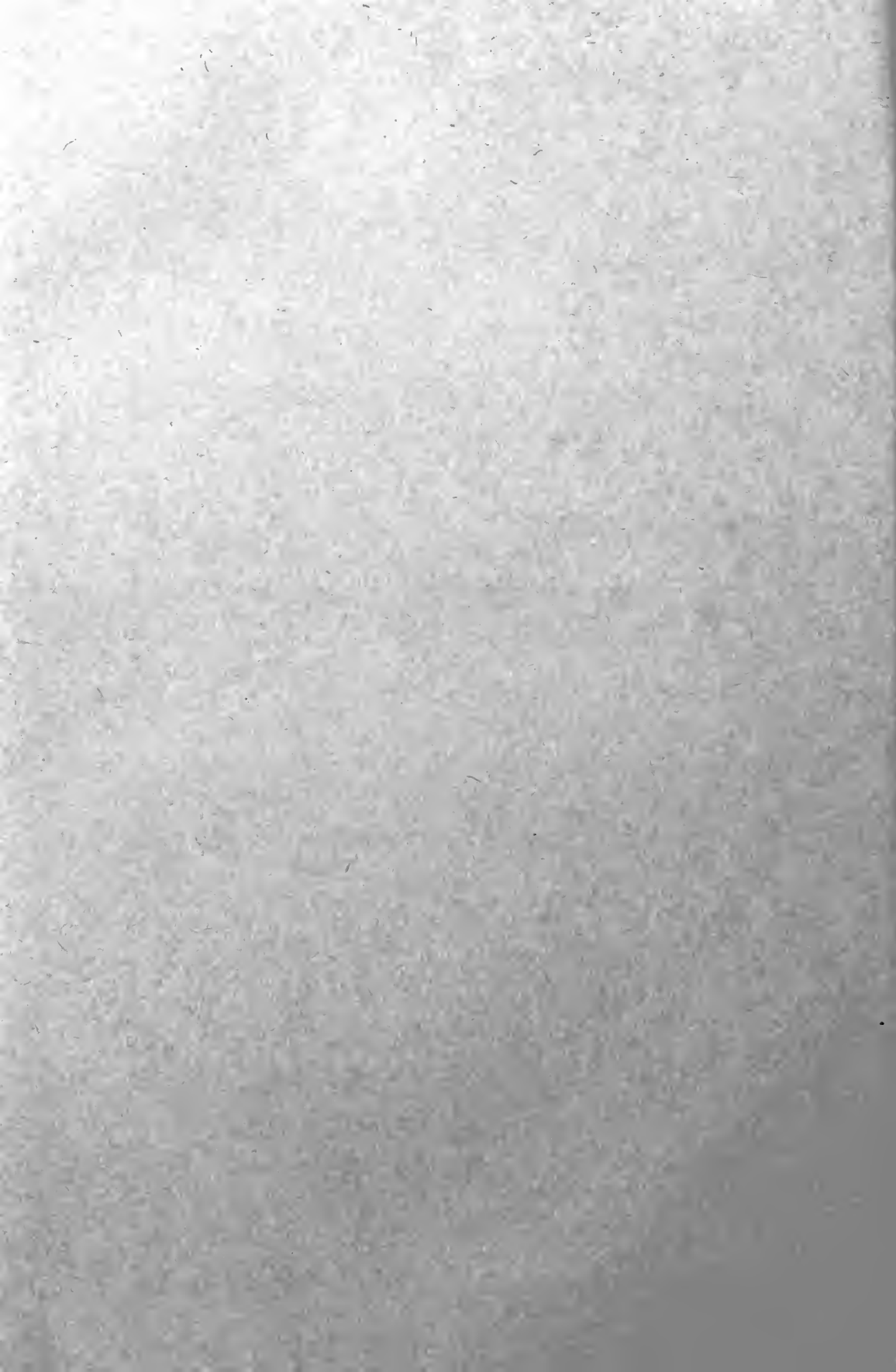
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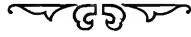
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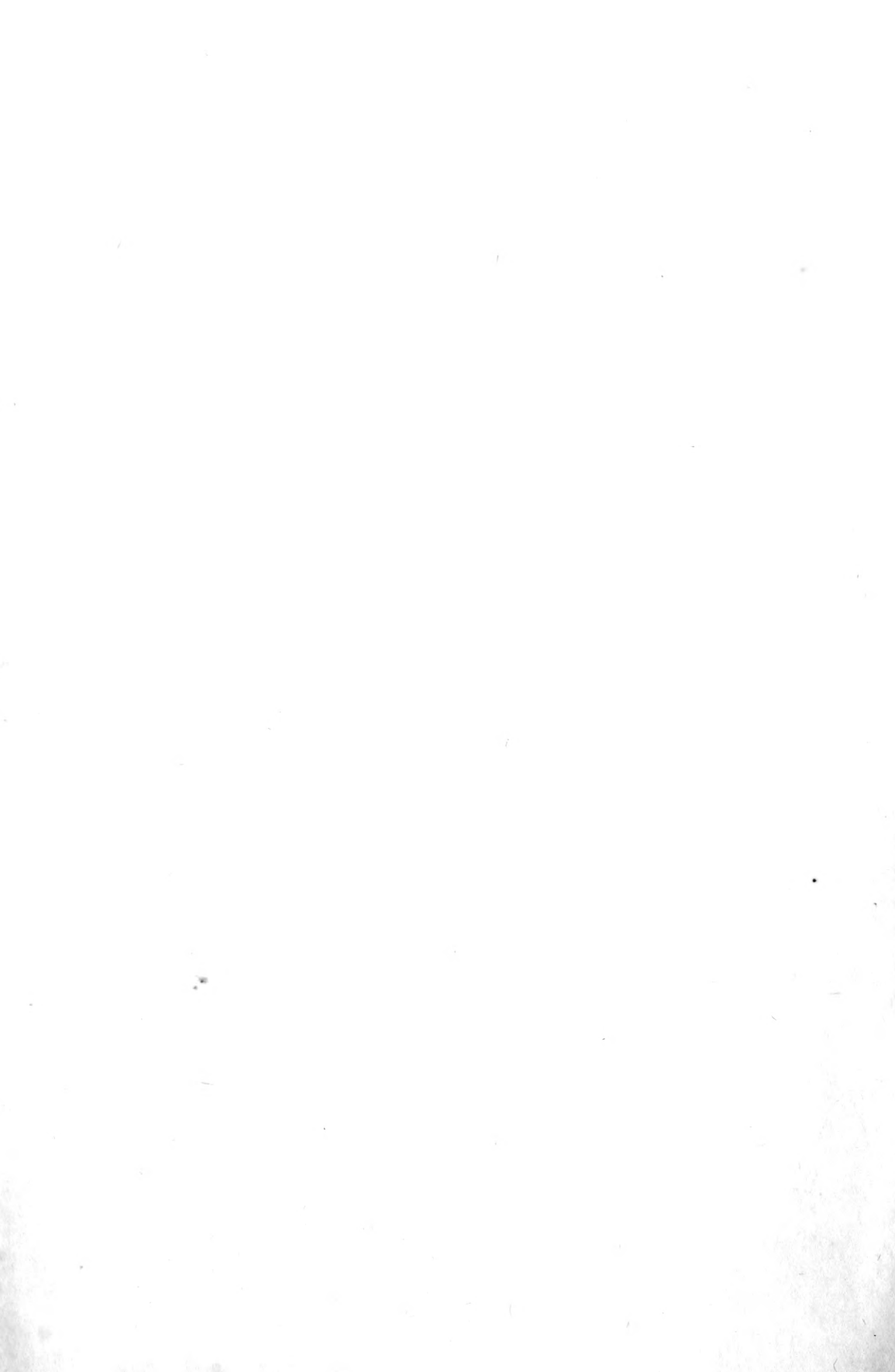
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